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VOLUME XXII

NUMBER 19

SPECIAL FEATURES

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A. S. M. E. AERONAUTIC MEETING
AERO DOPES AND VARNISHES

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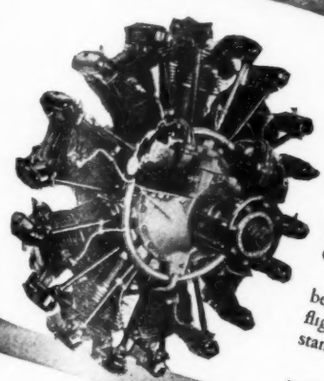

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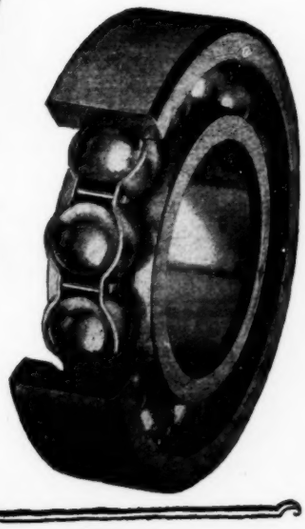

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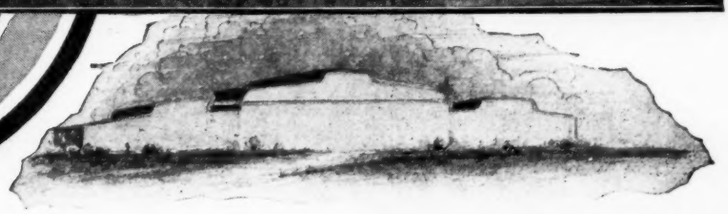

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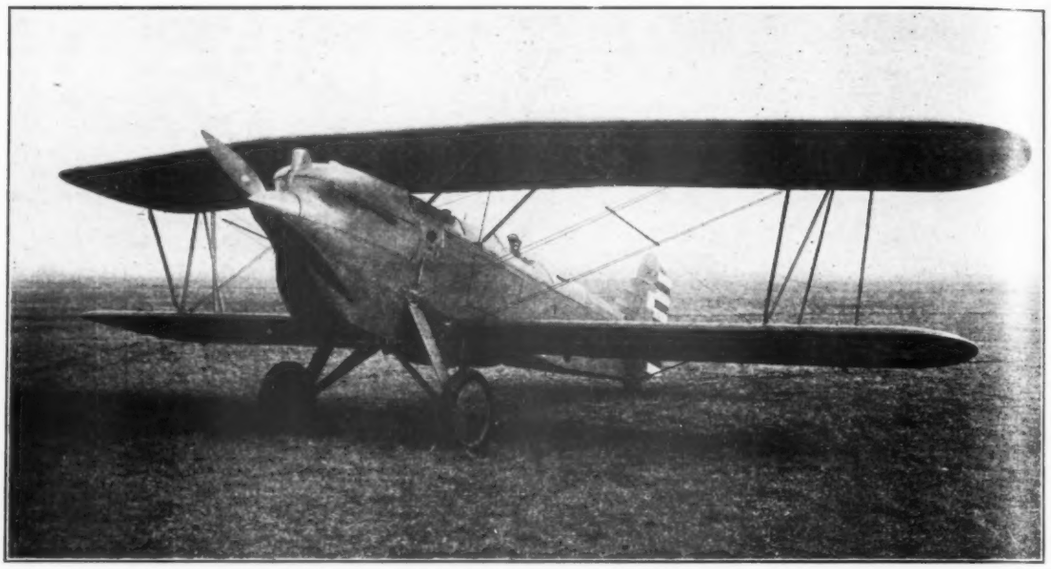

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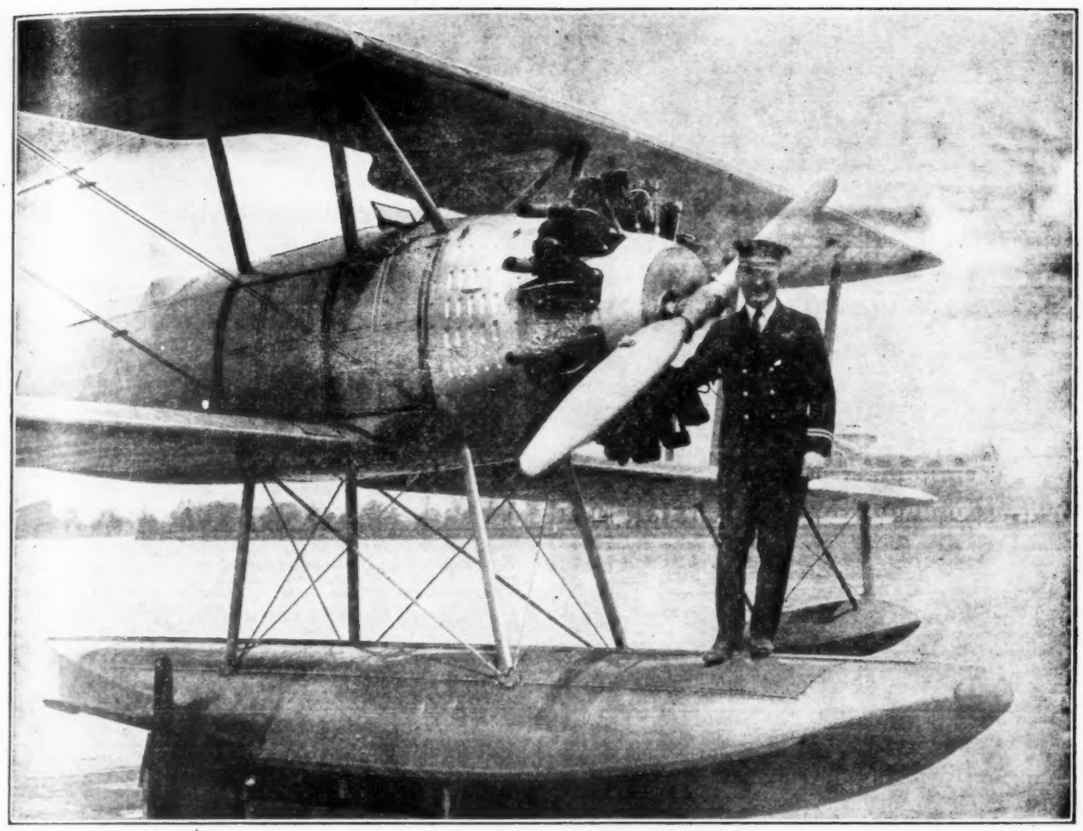

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With the Editor

For some time it has been known that the Guggenheim Fund for the Promotion of Aeronautics has been working on the preparation of a set of rules for a competition designed to promote the safety features in heavier-than-air craft and the recent announcement of the requirements of this competition to be known as the Safe-Aircraft Competition, came at a most opportune time. Seldom before has there been such an urgent need for the guiding of the thoughts of the general public in the right direction regarding the safety of modern commercial aircraft. Recent remarkable aeronautical performances have served to attract more than the usual quota of public attention to flying and the association of these splendid performances with a series of most unfortunate accidents must undoubtedly have served to confuse the public thought, for, as Mr. Guggenheim pointed out at the Yale Club recently, the public is unable to differentiate between straightforward commercial flying and what may be termed stunt performances attempted by the aeronautical pioneers in their endeavors to further the present wide possibilities of the airplane. The Guggenheim Fund rightly feels that more of the safety factor must be made inherent in the aircraft and it is now up to the aeronautical engineers of the World to act under the encouraging influence of the Competition, the rules of which are printed in full in this issue.

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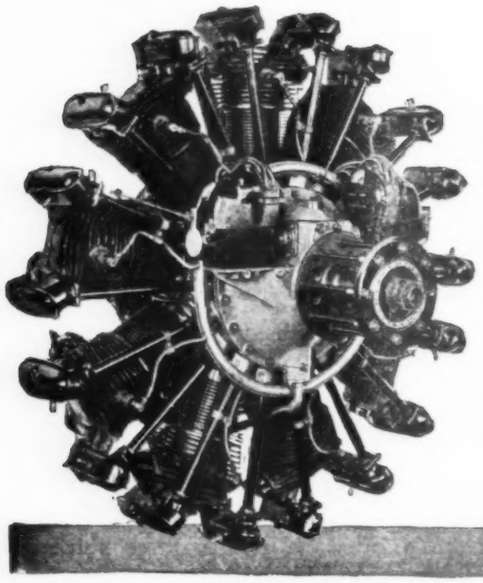

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WRIGHT AERONAUTICAL CORPORATION, *Paterson, N. J., U. S. A.*

MAY 13 1927

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VOL. XXII MAY 9, 1927 NO. 19

Greater Safety

THE PUBLICATION of the rules of the Daniel Guggenheim Safe-Aircraft Competition marks another forward step in the movement looking toward the better adaptation of the airplane to commercial needs. The competition makes the modest claim of seeking merely to increase the safety factor in flying, but safety, dependability and maneuverability are so closely linked that the winner of the $100,000 prize, under the requirements of the competition, will have made one of the greatest contributions to peace time aviation since the birth of mechanical flight.

The prime elements that enter into the efficiency of commercial aircraft are speed, safety and economy. Military aircraft can sacrifice safety and economy for maneuverability, a quality that is not of such great importance in air transport. Speed and economy are easily acquired but the greatest essential of all, safety in the absolute sense, or even to the degree of securing public confidence is an open field and the competition, if it advances this aeronautical requisite no matter how slightly, will have been eminently worth while.

This Competition differs from other movements heretofore launched for the practical promotion of aviation. First of all, it goes to the very heart of the problem underlying commercial flying. Next it offers a prize commensurate with the task it seeks to inspire. If the money were the sole reward, great stimulation would result but the greater prize will be the public confidence that will be placed in the winning airplane. To have judges of the character of these who have been appointed to certify to the safe attributes of any airplane would be almost enough an incentive. It is doubtful if the prize itself could have induced such a representative committee to serve, were it not for the previous fine generosity of the donor of the prize.

The confidence of the donors of the prizes is very great. They hope that the assurances they have received from all parts of the world that safety in almost an absolute sense can be had now, given the proper incentive, will be realized and that the world will become convinced that air travel is safe and its rapid expansion near at hand. The achievement of even relative safety would be more beneficial to the advancement of commercial aviation than all the speed contests, exploration adventures and long distance flights that have brought such remarkable fame to aircraft in recent years.

Two matters concerning the competition should be noted. One is that the powerplant has been given little or no attention. It has almost been assumed that this vital part of aircraft has reached as perfect a state of development as may be expected, or that the rewards for greater reliability in this field are so great that no monetary prize would act as an added incentive to this end. Another point is that the judgment of the committee will, after all, probably have to be based on opinion rather than the actual performance. And this will bring with it certain difficulties. If three government officials of high position could be secured by the railroad industry or the automobile industry to publicly place their impartial stamp of approval on a product possibly foreign, that will have great commercial possibilities, These industries would consider themselves fortunate, or possibly they would be a little fearful of the outcome.

There appears to be no difficulty in this country to induce capital to embark on almost any kind of aeronautical enterprise. To keep it interested and bring increasing profits has been the problem that has not been solved. Personal fortunes have been made in aeronautics, but capital in a large sense has remained shy except in ventures that had pioneering aspects with the resulting large prospective rewards. With the public convinced that the day of safety in flying has arrived capital will flow into the channels of aviation with such a volume that the principal objective of the Daniel Guggenheim Fund for the Promotion of Aeronautics will have been achieved.

Seaplanes vs. Landplanes Again

WITH THE date of the resumption of Commander de Pinedo's latest long distance flight drawing near, the question of seaplanes in long-distance cross-country, as well as cross-water flying, is again brought to the fore. The various possibilities of the large flying boat type of seaplane have frequently been pointed out in these columns and anyone who had the pleasure of listening to Commander de Pinedo when he addressed the luncheon in his honor in New York recently, could not fail to observe the great Italian pilot's enthusiasm for this type of aircraft.

Commander de Pinedo pointed out that in long-distance flying, especially where a new route is being pioneered, the possibilities of a pilot finding a suitable place in which to land in the event of a shortage of fuel or other contingency were infinitely greater in a seaplane than they would be in the case of a large transport airplane. The point made was that the probability of finding a wide enough stretch of water, assuming that a satisfactory route is chosen, is as likely as are the possibilities of a pilot of a landplane finding a large enough field in which to make a landing.

Commander de Pinedo Welcomed By Aircraft Industry In New York

Aeronautical Chamber of Commerce Greets Italian Flier.

ON FRIDAY, April 29, the Aeronautical Chamber of Commerce gave a luncheon to Comdr. Francesco de Pinedo, the Italian flier, who has recently arrived in New York City to continue his flight back to Rome in the new plane, which has been sent to him. Owing to the fact that time was very limited, the short notice of his arrival together with the Display to be held in Washington the following week, made it impossible for the Chamber of Commerce to arrange for a gathering commensurate with the importance of the occasion. A hurriedly-arranged luncheon, however, assembled a very representative gathering of aeronautical adherents. In spite of the shortness of the notice, Major Lester D. Gardner, who was primarily responsible for the luncheon arrangements, was able to secure the attendance of Assistant Secretary of Commerce William P. MacCracken, Jr., and Assistant Secretary of the Navy Edward P. Warner, who came from the U.S.S. Langley, which that morning had arrived in the Hudson River with the fleet. Assistant Secretary Davison telegraphed his regrets at his inability to be present.

Comdr. Francesco de Pinedo

The Guests

Among those at the speakers' table were, in addition to Commander de Pinedo: the Hon. Edward P. Warner, the Hon. William P. MacCracken, Jr., Grover C. Loening, Sidney B. Viet, Comdr. Silvio Scaroni, Charles L. Lawrance, C. M. Keys and Major Lester D. Gardner, who acted as toastmaster, briefly introduced the speakers.

Secretaries Warner and MacCracken both spoke, the former recalling the memorable arrival of Columbus at San Salvador, and comparing it with Commander de Pinedo's pioneering methods, and the latter characterizing the achievements of the great Italian flier in the same spirit as the remarkable victory of the Italian Schneider Trophy team at Norfolk, Va., last year. Major Gardner then called upon C. M. Keys, president of the Curtiss Aeroplane & Motor Company, Inc., to speak as representative of the aircraft industry. Mr. Keys, in common with the other speakers, lauded the remarkable aeronautical achievements of Italy, indicating that his close contact with outstanding aircraft chievements in this country, enabled him to appreciate all the more the Italian aeronautical progress.

It will be recalled that during his flight through South America, Commander de Pinedo passed the Air Corps Pan-American fliers in their Loening Amphibian planes, and it was fitting, therefore, that Grover Loening, on this occasion, should welcome Commander de Pinedo in the name of Major Dargue and his companions. Mr. Loening compared the flight of Commander de Pinedo from Rome with that of the Pan-American Good-Will fliers through South America. While the flight of the former had been noteworthy for its remarkably long nonstop stages, the Air Corps fliers had negotiated no less than 100 scheduled landings since the time they set out from San Antonio late last year. This fact in itself had made the Pan-American flight more remarkable and indicative of the development of modern aircraft, since it is in landing and taking off that the greatest hazard of flying lies.

Commander de Pinedo Speaks

Realizing how anxious were those present to hear from Commander de Pinedo, the guest of honor, Major Gardner refrained from any lengthy remarks, and immediately introduced the famous Italian pilot, who spoke in English with marked enthusiasm and interest. Regarding the remarkable achievements of American fliers with American equipment, Commander de Pinedo said how much he and his fellow countrymen appreciated the opportunity of competing with this nation in aeronautical progress, saying that he and his compatriots felt it an honor either to win or lose to Americans. Regarding long-distance flights, the speaker stressed the importance of attention to fine points, saying that no matter how excellent may be an airplane or its engine, if minor equipment details are not given adequate attention and consideration prior to start of any aeronautical venture, a failure is almost bound to result. Commander de Pinedo said that much of the time taken up in his preparation for all of his long distance flights had been given over to close inspection of the very smallest details of his machine and engines. He said that he preferred flying seaplanes on long distance flights to land type aircraft, since the average terrain, over which a long distance flight is made, presents more favorable conditions for landing a seaplane than landing an airplane. A large airplane must land on an intermediate landing field, prepared for the purpose, whereas, any spot of water, providing it is of adequate size, is suitable for a seaplane, particularly one of the flying boat type. Moreover, Commander de Pinedo indicated that he would very much prefer to land a large flying boat on a field in an emergency than he would land a large, heavily laden airplane on a very rough unprepared field. He had actually landed a seaplane on dry land with no serious results. Such a machine smoothly slides over the ground and at worst can only damage the under-side of the craft, whereas a large airplane, landing on bad ground, may cause the collapse of its undercarriage and immediately nose over and capsize, generally with serious results. For these reasons, Commander de Pinedo always carries out his long-distance flying in flying boat type seaplanes.

The luncheon adjourned with the Italian pilot expressing his thanks and appreciation for the hospitality of all his friends in America.

Belden To Move Part of Plant

The Belden Manufacturing Company, manufacturers of aircraft and other cable, insulated copper wire and cordage, with general offices at 2300 South Western Avenue, Chicago, Ill., have announced their intention of transferring part of their manufacturing activities to a new plant, now under construction, at Richmond, Ind.

The Guggenheim Safe-Aircraft Competition

Rules and Regulations for Safety Competition Outlined at Dinner by Harry F. Guggenheim

FOR SOME time it has been known that the Daniel Guggenheim Fund for the Promotion of Aeronautics, which has already done much for the development of commercial aviation and the extension of aeronautical education throughout the country, planned to hold a competition with a view to improving the safety of flying, believing that in this aspect of the flying problem lies the greatest need. For some months engineers, designers, pilots and many whose close contact with the aeronautical situation renders them valuable advisers, have been cooperating with the Fund in the formulation of a set of rules for a competition which would, while improving the safety of commercial aircraft, maintain the present characteristics of flying, which render it of such value to commerce.

These rules have now been drawn up and, with a view to announcing them to the aircraft world, the Guggenheim Fund, on the evening of April 29, gave a dinner at the Yale Club, New York City, to which approximately one hundred guests were invited. Among the honored guests at the head table were: Elmer E. Brown, Rear Admiral Hutchinson I. Cone, Hon. F. Trubee Davison, Comdr. Francesco de Pinedo, (who happened to be in New York City awaiting the delivery of his new plane from Italy), Harry F. Guggenheim, Dr. George W. Lewis, Hon. William P. MacCracken, Jr., Robert A. Millikan, Gen. John F. O'Ryan, Elihu Root, Jr., John D. Ryan, Comdr. Silvio Scaroni, Elmer A. Sperry, Dr. S. W. Stratton, Hon. Edward P. Warner and Capt. G. C. Westervelt.

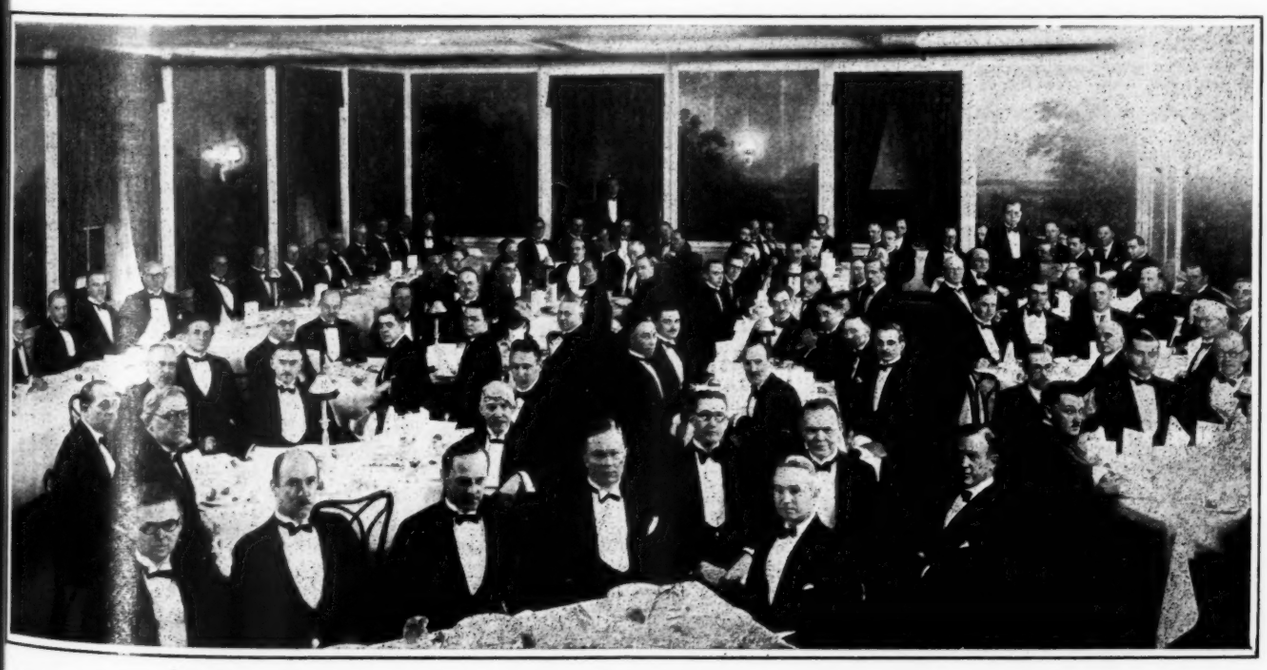
Speakers Discuss Safety

Among the speakers of the evening were the three assistant secretaries for aviation in Washington and Commander de Pinedo. Introducing Assistant Secretary Davison, Harry F. Guggenheim, who presided as toastmaster, mentioned with great appreciation the cooperation which the Fund had received from the War, Navy and Commerce Departments. Mr. Davison spoke with his usual brilliancy and humor and brought out the interesting point that, while the Air Corps could and would assist in the development of commercial aviation to the maximum extent, this assistance would always be somewhat limited by the one basic fact that "safety first", the motto of commercial aviation, could not be the slogan of service flying. The primary requirement of the Services was to achieve a definite aim, and, commensurate with carrying out this purpose to the fullest possible extent, safety to personnel came as a secondary consideration. In commercial aviation, however, the position was entirely reversed, and, therefore, the Guggenheim Fund was doing an excellent thing for the future of commercial flying, in fostering that aspect of the problem which could not be tackled in its entirety by either of the Services.

In the usual order of things, Assistant Secretary Warner was next called upon by the toastmaster to say a few words to the guests, and it was to be expected that he should tackle the subject under discussion in a technical vein. Secretary Warner discussed the present state of aeronautics from the safety standpoint and the possibilities of immediate improvement in the future under the impetus of the Safe-Aircraft Competition.

Assistant Secretary MacCracken, Jr., who was the third speaker, opened his remarks in his customary manner, with a brief story. Secretary MacCracken told a tale of two negroes who had left this world and, entering heaven, were questioned by St. Peter, the guardian of the gate, as to what they would desire in the form of a last opportunity to make good their happiness in after-life. One applicant for admission, bemoaning the fact that he had never had a real chance in this world, suggested that if he had $100,000 and freedom from work, he would be happy ever after. Reaching into the till, St. Peter immediately satisfied the request and proceeded to question the second party in the same way. This gentleman, also bemoaning the fact that he had never had a real chance in this world, requested merely a pair of dice and $10., saying that he would do the rest!

In a more serious vein, Secretary MacCracken suggested



TO SEEK SAFETY IN FLIGHT. The aeronautical dinner given at the Yale Club, New York City, by the Guggenheim Fund for the Promotion of Aeronautics, to announce the Safe-Aircraft Competition.

that the situation of those gathered at the dinner that evening was much the same as that of the second negro. The Guggenheim Fund could not of itself, merely by the use of the word "Presto", make aircraft absolutely safe, but the Fund provided "the dice and $10" and it was up to those present—the aircraft engineers, pilots, manufacturers and others to carry out the job of improving the safety of flying to a state where adequate commercial usage would be possible.

Before introducing the Safe-Aircraft Competition itself, Mr. Guggenheim called upon Commander de Pinedo, who, with his remarkable facility for expressing in English his valuable ideas, despite the handicap of an entirely foreign language to him, indicated the pilot's viewpoint on a competition such as the one under discussion. Commander de Pinedo pointed out that flying was safer than almost any other form of transportation, except during landing and taking off, and that it was in the improvement of conditions under which these maneuvers were carried out that the factor of safety lay.

Thereafter Mr. Guggenheim in a few words indicated the objects of the Safe-Aircraft Competition and tendered his thanks to those who, he said, had so willingly assisted in the formulation of the rules. Indicating that the entries for the competition would be received on Sept. 1, and that the competition closed on Oct. 31, 1929, or at any time prior to that date when the Fund may consider that its object had been achieved, he proceeded to introduce the various aspects of the rules, which, it is hoped, will result in the development of aircraft designs of marked safety characteristics.

Mr. Guggenheim's remarks regarding the Competition are summed up very admirably in the foreword to the Competition rules, as printed in a small pamphlet, issued by the Guggenheim Fund. In major part, this foreword follows:

Purpose of The Competition

"The average man's attitude toward air travel today is still very skeptical. He is interested in reading of flying exploits and glad when his country's airmen set new records, and probbly regards with mild resentment the reported superior aeronautical progress of other nations. But in the back of his head lurks a deep-seated reluctance to trust that most elusive of the elements—the air. The fury of tornadoes ashore or typhoons at sea for some reason holds less terror for him than the paradoxical business of defying gravity with heavier-than-air machines. He may send his letters by air mail but he prefers to let some one else do the flying.

"The Daniel Guggenheim Fund for the Promotion of Aeronautics has recognized from the outset that any effort to make air traffic an integral part of our national commercial life must first reduce and as nearly as possible entirely overcome the popular skepticism of air transportation. In meeting this problem the Fund has dealt frankly with aeronautical development as it stands today and, far from glossing over the fact that air travel is still attended by some risks, it has regarded those risks as one of the fundamental reasons for its own existence. The very first of its four general purposes is 'to promote aeronautical education, both academic and general,' and thereby to acquaint the public at large with the remarkable advances man has achieved in conquering the air and the astonishing degree of safety he has already attained.

"As a fundamental step in its educational program the Fund has planned and is hereby announcing a Safe-Aircraft Competition by which it hopes not only to demonstrate that airplane travel is basically as safe as railway and steamship travel, but to stimulate scientific investigation and practical invention into evolving new devices and principles whereby air travel will convert even the most confirmed skeptics and will take its place in our lives as the fleetest, cleanest and safest of the three recognized modes of travel today.

"The Daniel Guggenheim Safe-Aircraft Competition has been prompted by a conviction of the necessity and feasibility of aerodynamic safety. Its object is 'to achieve a real advance in the safety of flying through improvement in the aerodynamic characteristics of heavier-than-air craft, without sacrificing the good practical qualities of the present-day aircraft.'

"To this end the Fund is offering a First Prize of $100,000 and five 'Safety Prizes' of $10,000 each, which will be awarded in accordance with the Competition Rules set forth in the following pages.

"The whole development of aeronautics in the past decade has been greatly influenced by the exigencies of war. Safety is a civilian rather than a war-time need and for commercial purposes must be made of importance surpassing that of war requirements which are sometimes bought at the price of danger.

"Flying operations are daily making great progress in the training of personnel, in the establishment of airways and airports, the perfection of ground organization and, lastly, in improvement of communication and meteorological services in which there still remains so much to be accomplished. There has likewise been great progress in improvement of equipment, particularly in power plant reliability, structural safety, removal of fire hazards, and development of auxiliary flying equipment.

"Important progress has also been evidenced in many excellent designs by both American and foreign manufacturers in the aerodynamic qualities of aircraft, but this progress has been primarily directed toward efficiency rather than safety. In some of the basic features of aerodynamic safety, the design of most aircraft in use today, with notable exceptions, has not progressed much since the memorable flight of the Wright brothers at Kitty Hawk.

Experts Collaborate on Rules

"The rules of the Competition have been drawn to encourage development along the lines of safety, and have been drafted with the collaboration of aeronautical experts in many parts of the world. A preliminary and tentative draft of the rules was made in the first instance with the technical advice of Professor Alexander Klemin and Major R. H. Mayo, assisted by Mr. Archibald Black. In their final preparation, through the courtesy of Assistant Secretary of War Davison, the valuable assistance of Lieutenant E. E. Aldrin was made available. In addition, special consideration from the pilot's viewpoint has been given to the rules by Major R. W. Schroeder, Lieut. James Doolittle, and J. B. Hill, veteran Air Mail Pilot.

"Grateful acknowledgement is here made to these gentlemen for their earnest and splendid contributions in the cause of this Competition. Because of their number it is not possible to mention the names of the many organizations, manufacturers, engineers, pilots and scientists in America and Europe through whose invaluable advice and constructive criticism the completion of these rules has been made possible. Perhaps their efforts will bear fruit by inspiring progress through the very suggestivenes of rule.

"The Judges will be: Orville Wright, chairman, F. Trubee Davison, Assistant Secretary of War for Aeronautics, Edward P. Warner, Assistant Secretary of the Navy for Aeronautics, William P. MacCracken, Jr., Assistant Secretary of Commerce for Aeronauties, Commander R. E. Byrd, and Dr. George W. Lewis. The technical advisers will be three in number: Prof. Alexander Klemin, Lieut. E. E. Aldrin, and Major R. H. Mayo.

"The Fund cherishes the hope that the Competition will bring forth new inventions and ideas which will not only mark a notable advance in the whole field of aeronautics, but will go far toward establishing air transportation as an obvious, superior and safe mode of travel of infinite benefit to the human race."

Rules for the Daniel Guggenheim Safe-Aircraft Competition

The object of the Competition is to achieve a real advance in the safety of flying through improvement in the aerodynamic characteristics of heavier-than-air craft, without sacrificing the good practical qualities of the present-day aircraft.

PLAN OF COMPETITION

The Competition will be conducted in accordance with the following plan:

1. *Conditions for Entrance*

Application for entry will be received on and after Sept. 1, 1927. All applications must be made on forms which will be furnished by the Fund upon request. All applications must be forwarded to the Fund at 598 Madison Avenue, New York, N. Y. An entrance guarantee of one hundred dollars ($100.00) must be forwarded with the application and will be returned upon rejection of the entry, or upon the acceptance and presentation of the aircraft for test. Before any aircraft can be tested in the Competition full information as to its design and construction must be supplied to the Fund. The application must be accompanied by a statement giving in so far as possible the information called for in Appendix I, in which the applicant is required to produce evidence as to the aerodynamic characteristics of the aircraft and as to its general suitability for entering the Competition having the object given above. The Fund reserves the right to accept or reject any application for entry and to close the line of entries whenever, in its opinion, sufficient entries have been received to give a reasonable prospect that the object of the Competition will be achieved.

Any heavier-than-air craft based on any principle and built in any country shall be eligible for entry for the Daniel Guggenheim Safe-Aircraft Competition, provided preliminary evidence satisfactory to the Fund is produced that it will promote the object which the Daniel Guggenheim Safe-Aircraft Competition seeks to further. The employment of design features which, in the opinion of the Fund, are copied from the design of another competitor, may render the aircraft ineligible for entry.

2. *Qualifying Requirements*

Every aircraft whose entry for the Competition has been duly accepted will be called upon to demonstrate that it satisfies all the qualifying requirements which are prescribed in Appendix II. In the case of an aircraft which departs radically from conventional practice in securing flight, the Committee of Judges may substitute for those requirements that are impossible of attainment, other tests that will satisfy the object of the Competition.

3. *Safety Requirements*

On satisfactory demonstration that all the qualifying requirements are satisfied, the aircraft will be eligible to take part in the Competition proper, consisting of the safety tests and demonstrations in Appendix III.

4. *Prizes and Grants*

The winner of the Competition will receive a prize of $100,000, which amount will include the safety prize if previously received as provided below.

The winner will be the competitor whose aircraft satisfies the qualifying requirements and all the safety requirements and is awarded the highest number of points in the four safety tests enumerated in Appendix IV. Should more than one aircraft win the same maximum number of points, division of the prize will rest within the discretion of the Committee of Judges.

The first five competitors, in the order of presentation of their aircraft for examination and test at the designated field, whose aircraft satisfy all of the safety requirements called for in Appendix III, will each receive a safety prize of $10,000.

The Fund will consider an application for special grants toward the cost of transporting duly accepted entries to the place where the Competition is held, which will be at a flying field in the vicinity of New York City, on the basis of one dollar per mile in excess of 1,000 miles up to a maximum grant of $2,000 for any contestant. This grant will not be made until all the qualifying requirements have been satisfied.

5. *General Conduct of the Competition*

Notification of the result of their applications will be sent to applicants as soon as possible. The Competition will be held at a suitable field in the vicinity of New York City. The examination of the aircraft and the qualifying and safety tests will be held from time to time as designated by the Fund. The tests will be conducted by a Committee of Judges assisted by a Field Manager and Technical Advisers, selected by the Fund. Decisions of the Committee shall be subject to the approval of the Fund.

The general conditions under which the tests will be carried out are specified in Appendix V.

6. *Closure of Competition*

The Competition shall be closed on Oct. 31, 1929, and no aircraft will be accepted for test unless presented for test at the designated field on or before this date.

The Fund may advance the date of the closure if and when in its opinion the object of the Competition has been achieved.

If the date of closure is thus advanced, any contestant whose entry has been duly accepted before the date of the closure thus advanced, will be granted a reasonable extension of time in which to present his aircraft.

7. *Property Rights*

The award of prizes shall not entail the abandonment of any proprietary rights on the part of the contestant, but the Fund shall have the right to disseminate complete information pertaining to the aircraft in any way it sees fit.

Appendix I

INFORMATION REQUIRED WITH THE FORM OF APPLICATION FOR ENTRY

1. The name of designer and constructor. 2. Date when contestant will be ready to undertake test. 3. Three-view drawing. 4. Brief general technical description of the aircraft. 5. Type of engine or engines used, with particulars as to official type trials of such engines and fuel used. 6. Weight estimates and estimates of useful load and volumetric carrying capacity and the horsepower for which same are calculated. 7. Any performance estimates and calculations available. 8. Information and sketches as to power plant installation, seating, vision for the pilot, instruments and controls. 9. Any further information available including in the case of aircraft involving a radical departure from normal practice in aerodynamic form:

(a) Results of wind tunnel tests or any other data available.

(b) Statement as to whether a full scale aircraft of similar type has been flown previously.

In cases where it is not possible to supply the whole of the above particulars when application for entry is made, the fullest information possible in regard to the proposed design should be supplied at the time of making application, and the remaining items of information specified above should be forwarded to the Fund as soon afterwards as possible.

If the applicant desires to withhold any of the above information as likely to divulge valuable secrets, he should give his reasons for withholding the information and the Fund will decide whether such reasons may be considered valid.

Appendix II

QUALIFYING REQUIREMENTS

Every aircraft whose entry for the Competition has been duly accepted must be presented for examination and test at the designated flying field on the date designated by the Fund when the tests will be carried out within a reasonable time. Reasonable delay may be granted by the Fund.

Before an aircraft is presented for test the following additional information to that given in Appendix I will be required.

(1) Three-view drawing with principal dimensions of important parts.
(2) Dimensional drawings and particulars required for verification of stress analysis.
(3) Stress analysis in accordance with the methods approved for Civil Aircraft by the U. S. Department of Commerce or by any recognised Government Agency responsible for the issue of Airworthiness Certificates including a statement as to the materials used and the mechanical properties assumed for same. Stress analysis for machines in which sustentation is provided by other means than that of fixed wings shall be required to show the theoretical basis of the strength calculations for the structure as well as the calculations themselves.
(4) Balance diagram.

The following are the qualifying requirements every aircraft must satisfy:

1. *Power Plant*

The engine or engines used must be of a type which has been submitted to duly authenticated type tests, full particulars of which must be supplied by the entrant. The horsepower of the engine will be considered to be the rated normal horsepower at full throttle as developed with the same or equivalent accessories used in the type tests, and throughout the tests the r.p.m. of the engines shall be limited accordingly. During the whole of the tests in connection with the Competition, the fuel used shall be the standard fuel supplied by the Fund or fuel of the same quality as was employed during the type tests of the engine. The aircraft must be provided with mechanical or electrical means of starting the engine or engines, or alternatively the engines may be started by hand providing a starting gear is fitted which involves no risk of injury to personnel. Starting by direct pulling over of propellers by hand will not be permitted. Any starting gear used will be considered to be a part of the aircraft and must be carried throughout the Competition.

2. *Structural Strength*

The structural strength of the aircraft shall be in accordance with the requirements of the U. S. Department of Commerce Air Regulations. Where a designer has reason to deviate from such requirements an explanatory statement should be submitted with his stress analysis. Copies of the U. S. Department of Commerce Air Regulations and of the method proposed for stress analysis by the Department of Commerce will be furnished on request.

If the contestant contemplates landings made with considerable vertical velocity, computations for strength of landing gear covering this condition should be submitted.

If an aircraft shows structural weakness during the Competition, test of the aircraft may be discontinued at the discretion of the Fund.

3. *Performance*

When carrying full load the aircraft shall satisfy the following minimum requirements in regard to performance:

Maximum Speed (corrected to standard air at sea level) 100 m.p.h.
Rate of Climb (at 1,000 ft.) 400 ft. per min.

4. *Useful Load*

The aircraft shall carry 5 lb. of useful load per h.p. "Useful load" shall include: Pilot, Observer, Fuel, Oil, and any special instruments or equipment fitted by the Fund for the purpose of the Competition.

5. *Fuel and Oil*

The aircraft shall provide tank capacity for fuel and oil for 3 hrs. at full throttle at the normal r.p.m. as given in the type tests.

6. *Instruments*

The aircraft shall be provided with all necessary power plant instruments required by the engine installation, and the following flying instruments: Altimeter, Air Speed Indicator.

7. *Accommodation*

Adequate accommodation and dual control for pilot and observer. For every 10 lb. of useful load carried in addition to the items specified under (4) above, there shall be provided at least one cubic foot of cabin or cargo space.

8. *Vision*

Adequate vision must be provided for the pilot.

9. *Fire Risks*

All reasonable precautions against fire risks shall be provided in the design. At least one fire extinguisher of approved type shall be carried and placed conveniently for the pilot; the weight of this shall not be included in useful load.

The aircraft will also be required to demonstrate that it can be easily handled and moved by ground personnel as required of any aircraft operating for commercial purposes.

Appendix IV

BASIS FOR THE AWARD OF THE PRIZE

Points will be awarded as specified in the four following tests:

	Maximum Number of Points Obtainable
1. *Speed Tests*	
(a) 2 points for every m.p.h. less than 35 m.p.h. at which level controlled flight can be maintained	10
(b) 4 points for every m.p.h. less than 38 m.p.h. which is not exceeded in a steady controlled glide during a period of 3 minutes.....	24
(c) Any aircraft which obtains a combined total of at least 24 points under tests (a) and (b) will be eligible to receive points for high speed in excess of 110 m.p.h. as follows: 1 point for every 2 m.p.h. in excess of 110 m.p.h. at which level flight can be maintained.	10
2. *Tests of Landing Run* 2 points for every 3 ft. less than 100 ft. in coming to rest after first touching ground...	40
3. *Test of Landing in Confined Space* 1 point for every 2 ft. less than 300 ft. from the base of an obstruction 35 ft. high in coming to rest after gliding in over the obstruction	75
4. *Test of Take-Off* 1 point for every 15 ft. less than 300 ft. required to take off from standing start	15
1 point for every 10 ft. less than 500 ft. to clear obstruction 35 ft. high from a standing start	26
	200

Appendix V

GENERAL CONDITIONS

1. Contestants shall comply with the Rules laid down by the Field Manager in regard to all work and conduct on the Field.
2. Aircraft shall be kept at the designated field throughout the Competition unless special authority for its removal is obtained in writing from the Field Manager.
3. Aviation fuel of standard quality will be supplied free of charge but another fuel may be used provided such fuel was used in the official trials of the engine or engines employed.
4. Prior to any tests made by the Fund, contestants may be required to demonstrate in flight by their own pilot that their machines are airworthy and provided with proper controls.
5. All tests in the Competition will be carried out by pilots supplied by the Fund but contestants shall be given reasonable opportunities for instructing the Fund's pilot in the flying of their aircraft prior to the commencement of the tests.
6. Contestants shall supply their own mechanics and transport, and prepare and maintain their aircraft during the Competition at their own expense.
7. The Fund will accept no liability at any time in connection with any risks involved to the aircraft or to the contestant's personnel, or in connection with any third-party risks involved when the aircraft is being flown by the contestant's pilot.
8. The contestant will not be held liable for injury to flying personnel representing the Fund.
9. The Fund may at any time suspend temporarily or permanently any aircraft from taking further part in the Competition if, in the opinion of the Fund, danger to flying personnel is involved, or the object of the Competition is not likely to be furthered by proceeding with tests of such aircraft.
10. Contestants shall be allowed at least three fair attempts to pass any test.
11. Alterations to the aircraft during the Competition may be approved, but any such alteration may entail re-qualification in any or all of the tests at the discretion of the Fund. Unauthorized alterations may entail elimination from the Competition.
12. Variations in the form of features of the aircraft which cannot be conveniently and easily effected by the pilot during flight, as, for example, variations in angular settings of supporting surfaces, will be regarded as alterations.
13. The same design of propeller shall be used throughout the trials. In case of propeller breakage or damage a new propeller of identical design may be substituted. Propeller blade settings must be the same throughout the test except that a pitch-varying mechanism may be used if it can be operated from the pilot's cockpit during flight.

Swiss Entry for Balloon Race

The Contest Committee of the National Aeronautic Association received word April 25, from the president of the Aero Club of Switzerland, announcing the entry of one balloon by that club in the Gordon Bennett International Balloon Race, to be held in the United States this summer.

New Travel Air Monoplanes On Delivery

One of the new Travel Air monoplanes, powered with a Wright Whirlwind engine, was recently flown from Wichita to California, for delivery to Pacific Air Transport, this making six Travel Airs in the service of that company. At the same time, an OX-5 Travel Air was flown to San Francisco from Wichita by D. C. Warren of the former city. Mr. Warren has taken the agency for Travel Air in seven Pacific states. Before leaving Wichita a weight-carrying test was made with this plane. Ten sacks of sand were loaded into the cockpit, which, with the pilot, oil and gasoline, made a total weight of 1300 lb., equivalent to the weight of the plane itself. A very gratifying flight was made, with a safe landing.

Work on the new Travel Air factory is progressing nicely, and should be completed in about sixty days. There will be almost 21,000 ft. of floor space, and the location at Wichita's excellent Municipal Airport is an ideal one.

Among the interesting features developed on the new Travel Air monoplanes, being built for the National Air Transport, for mail service, is the matter of rapid change of engine. Suspension and accessibility are so arranged as to permit a complete engine change in fifteen minutes. This can be done in approximately the time required to take on gasoline and oil or unload and load mail. Perhaps the greatest advantage in this from the standpoint of economical operation of such routes is the reduced capital investment in spare planes along the routes. It is only necessary to carry spare engines and minor parts. Another excellent feature is the superior vision, it being virtually that of a bird. The pilot can see in every direction, there being no blind spots. With the aid of the wheel brakes the monoplane can be taxied in the highest wind. In a recent test, it was flown over 200 miles with the joy-stick completely removed from its socket, the unusual balance and stability sustaining altitude and direction. With a load consisting of one pilot weighing 160 lb., 80 gal. of gasoline, 750 lb. sand ballast and 250 lb. of night flying equipment, take-off was accomplished in 13 sec., climb was 750 ft. the first minute and a high speed of 125 m.p.h. was attained, despite the fact that the night flying lamps ordinarily slow down a plane from two to three m.p.h.

Los Angeles Back from Pensacola

Upon returning to Lakehurst, N.J., from a training flight to Pensacola, Fla., the U.S. Navy airship Los Angeles waited sixteen hours before it attempted to make a landing.

The Los Angeles arrived at Pensacola on April 24 carrying Rear Admiral W. A. Moffett, and tied up over night to the mooring mast attached to the airship tender Patoka, in Pensacola Harbor. It left Pensacola at 3:30 p.m. on April 25, carrying a ten per cent excess supply of fuel and ample provisions for the personnel. The airship flew up coast and arrived at Lakehurst at 10:30 on the morning of April 26. A northeast wind was blowing at the rate of 45 m.p.h. and Comdr. Charles E. Rosendahl decided to remain aloft until weather conditions became more favorable.

The present landing crew at Lakehurst consists of 125 enlisted Navy men, experienced in the work, an additional 100 enlisted Navy men, who replaced the 186 Marines, who were sent to China, and 100 civilian workmen at the air station. The airship circled over the field and the hangar several times during the morning and then flew seaward and spent the afternoon along the coast within sight of the air station. It was running on two engines in order to conserve the fuel supply.

It was planned to land the airship at sundown, but when preparations were about completed for the landing, a strong wind blew up accompanied by a heavy rain. Between 10 o'clock and midnight, the wind varied from fifteen to thirty m.p.h. At 2 a.m. the wind had abated and the airship was landed at 2:30 a.m.

Appendix III

SAFETY TESTS AND DEMONSTRATIONS

Every aircraft shall be subjected to the following safety tests which shall be carried out in any sequence the Fund may determine.

(*Note*) *The use of devices by which the aerodynamic characteristics of the aircraft can be varied during flight will, in general, be permitted, subject to the following conditions:*

If the device is not automatic and requires operation by the pilot, the operating control must be simple, quick in action and conveniently placed, and must not involve appreciable physical effort by the pilot. If in the opinion of the Fund the safety of the aircraft is prejudiced by dependence on the operation of such device in emergency, the aircraft may be called upon to pass any or all of the safety tests at one fixed setting of the device, in which case the Rate of Climb Test under "Qualifying Requirements" must be passed at the same fixed setting of the device.

1. *Speed Tests*

Object. To demonstrate the ability of the aircraft to fly and glide at much lower speeds than is possible in the case of present-day commercial aircraft, thus reducing the risk involved in negotiating forced landings, particularly under conditions of bad visibility and when approaching small and confined landing space.

Requirements

(a) Minimum Flying Speed.
The aircraft to maintain level and controlled flight at a speed not in excess of 35 m.p.h.

(b) Minimum Gliding Speed.
The aircraft to be able to glide for a period of 3 minutes with all power switched off, during which time the air speed shall never exceed 38 m.p.h.

The aircraft will not be considered to have passed either of the above tests unless it is clearly demonstrated that each and all of the controls are properly effective at the minimum speed specified.

2. *Test of Landing Run*

Object. To demonstrate the ability of the aircraft to effect a safe landing in a small field.

Requirements

The aircraft shall land with all power switched off, and after first touching the ground shall come to rest within a distance of 100 ft. The landing shall be made in a straight line; turning, side slipping or trick flying will not be permitted.

The use of braking devices will be permitted provided that control is fully retained until the aircraft has come completely to rest and provided that no serious injury to the surface of the landing field results.

Such braking devices must not require special equipment which is not carried on the aircraft in flight.

3. *Test of Landing in Confined Space*

Object: To demonstrate that in case of complete engine failure the aircraft can approach and land in a small confined space surrounded by obstructions, such as trees, buildings, etc.

Requirements

The aircraft shall make a steady glide in over an obstruction 35 ft. high and land in a straight line with all power switched off. After landing, the aircraft shall come to rest within a distance of 300 ft. from the base of obstruction.

The approach to the landing ground shall be straight; turning, side slipping, or trick flying will not be permitted.

The use of braking devices will be permitted under the conditions set out under (2) above.

4. *Test of Take-Off*

Object: To demonstrate that the aircraft can take off from a small field and after taking off can climb at a steep angle so as to clear obstructions, such as trees, buildings, etc.

Requirements

(a) The aircraft shall take off after running not more than 300 ft. from a standing start. The aircraft will not be considered to have passed this test if it touches the ground again after taking off.

(b) After taking off within a distance of 300 ft. from a standing start, the aircraft shall clean an obstruction 35 ft. high at a distance of 500 ft. from rest. The approach to the obstruction shall be straight and trick flying will not be permitted. External assistance in starting the run will not be permitted in either (a) or (b).

5. *Test of Gliding Angle*

Object: To demonstrate the ability of the aircraft to glide for a reasonable distance in case of engine failure and alternatively to glide at steep angles in order to facilitate the approach to a possible landing ground.

Requirements

(a) *Flattest Glide*: The aircraft shall be able to glide with all power switched off so that the angle between the flight path and the horizontal is not greater than 8 deg.

(b) *Steepest Glide*: The aircraft shall be able to glide with all power switched off so that the angle between the flight path and the horizontal is not less than 16 degrees. During this test the air speed shall not exceed 45 m.p.h. In both cases the aircraft must demonstrate that all the controls are definitely effective throughout the test, and that it can land safely out of this glide from a useful altitude.

6. *Test of Stability in Normal Flight*

Object: To demonstrate that the aircraft is stable under all normal flying conditions, that is to say that if the attitude of the aircraft is disturbed either by gusts or by the application of the controls, the aircraft shall return to its original attitude of its own accord when the controls are left free.

Requirements

(a) *Longitudinal Stability*: The aircraft to be provided with means by which it can be trimmed so as to fly with the elevator control free at any speed within the range of 45 m.p.h. to 100 m.p.h. and at any throttle opening of the engine or engines. The test of longitudinal stability shall be as follows:

The elevator control to be moved toward its maximum extent either backwards or forwards sufficiently to give a fair test of stability and then released. In either case the aircraft must return to steady flight in its original attitude within a reasonable time.

(b) *General Stability*: The aircraft to be capable of flying at any air speed from 45 m.p.h. to 100 m.p.h. and at any throttle opening of the engine or engines with all controls left free for a period of not less than 5 minutes in gusty air.

In the case of a multi-engine aircraft, all the engines may be throttled to the same extent.

During any of these tests, the aircraft must hold a reasonably steady course and if disturbed from its normal attitude, must return to such attitude, within a reasonable time and without losing height appreciably.

7. *Test of Ability to Recover from Abnormal Conditions*

Object: To demonstrate the ability of the aircraft to recover from any altitude into which it may get either because of disturbances in the air or of incorrect application of the controls by the pilot, or of sudden failure under difficult circumstances.

Requirements

(a) *Test of Ability to Maintain Control in Case of Engine Failure*: The aircraft must demonstrate that it can be satisfactorily controlled by the pilot in case of sudden engine failure when flying at any attitude. In case of multi-engine aircraft, the pilot must be able to maintain control when any one of the engines or any combination of the engines or all of the engines suddenly fail.

The aircraft will be required to demonstrate that in case of complete engine failure (all power being switched off) it will take up a steady gliding attitude when all controls are left free from the moment of switching off the engine or engines.

The aircraft will further be required to demonstrate that if the elevator control is pulled in toward its maximum extent at the moment of switching off and held in that position, the aircraft will remain under control, not get into any violent or dangerous manevers, and descend on a steep glide path at a speed not exceeding 40 m.p.h.

(b) *Test of Ability to Recover from Violent Disturbances*: 1. The aircraft to be dived with all power switched off until air speed reaches 20 per cent above maximum level flying speed. At this speed it must answer all the controls correctly and effectively. All controls will then be released and the aircraft must of its own accord return to a steady gliding attitude without serious loss of height.

The aircraft may be required to pass this test when trimmed for any speed from 80 m.p.h. to 110 m.p.h.

2. The aircraft to be flown at full throttle at an air speed of 45 m.p.h. trimmed for any speed from 45 m.p.h. to 75 m.p.h. The engine is to be switched off and at the moment of switching off, the pilot is to move any one or any two, or all of the controls in such a manner that an abnormal attitude results. Complete recovery is to be made with the aid of the controls and a steady glide to be taken up with a loss of height of not more than 250 ft. from the height at which the abnormal flight attitude was obtained.

The same test is repeated with the exception that when in an abnormal flight altitude, all controls are to be released, and the aircraft must make complete recovery of its own accord and take up a steady gliding attitude with a loss of height of not more than 500 ft.

8. *Test of Controllability*

Object: To demonstrate that the control system is simple and easy to operate and that under all conditions of flight and gliding, effective control in all senses is maintained. Every aircraft must be equipped with three substantially independent controls corresponding to three axes mutually at right angles and these three controls must continue to be substantially independent and collectively effective in the same direction at any attitude of the aircraft from the attitude at maximum level flying speed to the attitude at the steepest glide and at any throttle opening of the engine or engines. The aircraft must clearly demonstrate that it is not subject to complete loss of control when any particular attitude is reached, such as the loss of control which accompanies the phenomenon of stalling.

Requirements

The aircraft will be required to demonstrate the effectiveness of each and all of the controls at any speed and at any attitude from the attitude at maximum level flying speed to the attitude at the steepest glide and at any throttle opening of the engine or engines. This will be tested by making definite and sharp movements of any particular control or controls, which must result in the aircraft making corresponding definite rotations about the respective axes. The controls must not only be effective in producing disturbances of attitude but also in enabling rapid and definite recovery to be made from disturbances.

The effectiveness of any one control or combination of two controls when the other control or controls are left free or held in fixed position must be demonstrated.

The aircraft may be called upon to pass these tests in calm or gusty air.

9. *Tests of Maneuverability in Restricted Territory and on the Ground*

Object: To demonstrate that the aircraft can be safely and effectively maneuvered when taking off or landing in restricted territory and when taxying on the ground under its own power without external assistance.

Requirements

(a) *Maneuverability in Restricted Territory*: A square plot, 500 ft. by 500 ft. will be marked off and shall be considered as surrounded by an obstruction 25 ft. high along its entire boundary. The pilot shall take off in any manner he judges best, and climb either above the square plot or outside of it, providing he passes above the imaginary boundary obstruction. The engine may be switched off at any time and the pilot shall land the aircraft within the square plot without passing through the imaginary boundary obstruction.

(b) *Maneuverability on the Ground*: The aircraft will be required to demonstrate that it can be taxied under its own power and without external assistance in any direction in a wind whose mean speed at ground level is at least 20 m.p.h.

Apparent Present Tendencies in Airplane Design*

A Brief Review of Recent Developments and Practice in Various Countries, Pointing Out Successful Results Obtained with Designs of Widely Different Types

By V. E. CLARK
Vice-President and Chief Engineer, Consolidated Aircraft Corporation

A DISCUSSION OF the tendency in airplane design might deal with one or both of two phases: (a) the past and present, and (b) the future. In this paper the author, lacking the courage to venture predictions, will confine himself to a brief review of the immediate past.

It seems that a fair answer to the question, "In what direction is airplane design leading?" would be: "Scattering in all directions." At no time during the brief history of aviation have there been *successful* airplanes of so many widely differing types—aerodynamic and structural.

One reason for this encouragingly healthy state of affairs may be that more and more engineers are being developed who combine native imagination with a sound knowledge of the pertinent fundamental sciences and a sufficient amount of practical experience (and horse sense) to justify risking the hazards of pioneering, instead of cautiously copying a traditional scheme that has "worked" but which may have become conventional merely because it happened to have been the luckiest result of several early cut-and-try endeavors. One says "encouragingly healthy" with the firm conviction that it would be most unfortunate for us to attempt to standardize at this time, on the assumption that the possibilities of the science have been sufficiently thoroughly investigated and developed to warrant standardization. To be trite, the longer one observes aviation the more one must realize what a tremendous amount is to be learned.

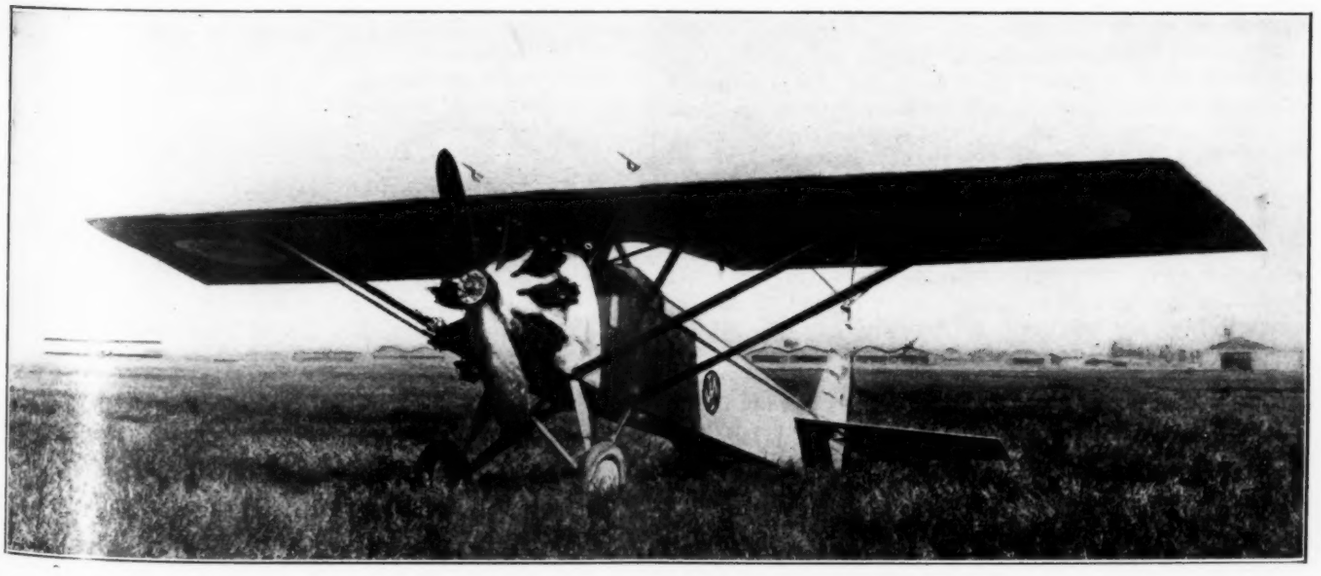
The diversity of development between nations is much greater than that between constructors of any one nation. While there is no defined "school" of design adopted within any one nation, there is consistently more similarity intranational than international. One reason for this is the influence of governmental policies as affected by peculiar contemplated military problems and by the availability, among national resources, of special basic materials. Great Britain, for example, must build airplanes which will be durable in all sorts of climates, hot and cold, dry and wet, and which may be maintained in service thousands of miles across the water from their home factories. Other nations lack certain indigenous basic materials. The United States, in this particular, is very fortunate. We have iron, chromium, molybdenum, nickel, silicon, manganese, vanadium, aluminum, copper, magnesium, cadmium, spruce, birch, long-fiber cotton, nitrates, and fuel and lubricating oils. In fact, nature has endowed our country with every element necessary for the fabrication and operation of aircraft. For the few elements we lack, we have acceptable substitutes.

*Paper presented at the National Meeting of the A.S.M.E. Aeronautic Division, Buffalo, N. Y., April 25-26, 1927.

Great Britain

Of the great powers, England is probably the most conservative in aerodynamic design and in the use of materials and manufacturing processes. By far the great majority of modern successful British airplanes are of the type which has flown well for the longest time: the tractor biplane with wings of thin section externally braced, usually with a two-bay cellule and usually of equal spread and chord. Most of the construction is of wood, with fittings of sheet steel. Captain De Haviland, whose DH-4 we know so well in this country, has designed a great number of useful machines, in the general scheme of all adhering to the type of aerodynamic design and of construction which he adopted many years ago. His fuselages are of wooden sticks taking compression and forming the framework for an outside covering of plywood which completes the structure by tying the sticks together and taking diagonal tension loads.

In England, welding in vital structures is discouraged. Very little duralumin (we shall use this term for aluminum-copper alloys for convenience at the cost of accuracy) is used, notwithstanding the fact that one of the foremost airplane manufacturers, the Vickers Company, fabricate this material commercially in various forms. The Boulton & Paul Company



The Wibault all metal single seater fighter (Jupiter engine)

The A.S.M.E. Holds Two-Day Aeronautical Meeting in Buffalo

Notable Aeronautical Speakers Address Mechanical Engineers. Members Visit Factories and Airport.

THE American Society of Mechanical Engineers held an Aeronautic Meeting in Buffalo on April 25 and 26. The A.S.M.E. was founded some forty-seven years ago and is one of the most powerful engineering societies in this country. Their formation of an Aeronautic Division and their organization of this meeting is another indication of the growing interest which American engineers are showing in aeronautics. The meeting was held under the auspices of the Buffalo Section and engineers from all parts of the country were in attendance.

The technical session was opened on the morning of April 25 with C. Roy Keyes of the Curtiss Aeroplane and Motor Co., presiding. Opening remarks were made by A. H. Lane of the Buffalo Section and the guests and members of the A.S.M.E. were welcomed by the Hon. Frank X. Schwab, Mayor of Buffalo. The first paper to be presented was on "Transport Airplanes" by Anthony Fokker of the Atlantic Aircraft Corp. Mr. Fokker illustrated his talk with lantern slides and brought out many points of interest. He stressed the greater efficiency of single-engined planes as compared to multi-engined machines and showed the sacrifices which were being made to obtain increased reliability in the latter. He suggested the use of multiple engines driving a single propellor as giving reliability and at the same time aerodynamic and structural efficiency. Mr. Fokker stated that, in his opinion, metal would ultimately surplant wood in airplane construction but that at present welded steel fuselages and wooden wing construction were so much cheaper that all-metal planes could not compete in an unsubsidized commercial market.

The Safety Competition

Harry F. Guggenheim, president of the Daniel Guggenheim Fund for the Promotion of Aeronautics, read an outline of the rules for the safety competition which the fund is promoting through the offer of substantial prizes. In general, the rules attempt to promote a practical plane rather than a revolutionary freak which will excel only in one particular. In the competition, points will be granted for landing under 35 m.p.h. provided the high speed is over 110 m.p.h. Steep glides at slow speeds, short runs after landing and quick climb are all encouraged and certain minimum performances are provided to insure that the plane will be practical. The reading of the rules by Mr. Guggenheim was followed by an interesting discussion. In the afternoon, the delegates to the meeting visited the Curtiss and the Consolidated factories. The Curtiss Company was busy building pursuit planes and D-12 engines. The Consolidated Aircraft Corporation is building training planes for both the Army and Navy.

In the evening a banquet was held at which Elmer Sperry gave a most interesting and encouraging talk on the development and possibilities of the heavy oil engine for aeronautical use. Mr. Sperry considered that many of the most difficult problems had been solved and that in a few years the heavy fuel oil engine would be actually lighter per horse power than present day gasoline engines. The Hon. William P. MacCracken, Jr. was the principal speaker of the evening. As usual, he gave a most interesting and pleasant discourse and, among other things, pointed out that commercial aviation had progressed so far in this country that it was actually subsidizing the Government on certain of the air mail routes.

On April 26, papers were read by Col. V. E. Clarke, vice-president of the Consolidated Aircraft Corp.; Bishop Clements, metallurgist for the Curtiss company; and by Major Satterfield, the designer of the Buffalo Airport. Earl D. Osborn, of New York, presided at the meeting. Col. Clarke outlined the trend of design throughout the World and emphasized the individuality of the design ideas of different countries as proving that airplane design was still in a fluid state. Mr. Clements, speaking on "The Metallurgy of Aircraft Engines" brought out the fact that the metals used in engine construction could all be produced in this country and that, though the basic materials used were much the same as those used by the automobile industry, there was an immense difference in the thoroughness with which they had to be handled and inspected. Major Satterfield gave a most illuminating talk on the problems involved in the building of an airport and brought out the difficulties of getting sound advice from the mass of conflicting opinion about the size, shape and facilities needed at an airport.

A MODEL AIRPORT. The airport of Buffalo. The administration building will be seen in the lower left hand corner.

In the afternoon the A.S.M.E. party visited the Buffalo Airport and were very much impressed by the size and excellent layout of the field. An idea of the size of the field was obtained when the three-engined Ford Transport plane took off in considerably less than one quarter of the length of the cinder runway. There was, it is true, a fair wind blowing but the plane carried 1,400 lb. of Ford parts. The pilot of the plane stated that, the day before, he had reached an altitude of 15,000 ft. with a load of 2,000 lb.

The airport has three fine hangars and it is expected that a new one will be built shortly. The administration building commands a fine view of the field and has most comfortable quarters for pilots. There is also a machine shop and garage. Looking at the vast expanse of the field and the excellence of the buildings it was evident that the City of Buffalo is looking forward to the time when national and international air traffic would develop on a great scale. The party ended the session by a visit to the Ehrhardt factory where a new type of pursuit plane is being built.

tion and triangulated together by riveted duralumin strips, beaded to give rigidity in compression except at the ends which are flat and riveted to the tubes. These strips lie in every direction necessary to complete, in conjunction with the skin, the trusses for lift, drag, and torsion.

The structure is very rigid but, to all appearances, very costly in man-hours, because of the tremendous number of rivets which must be headed from the inside of tubes and at other inaccessible or, at best uncomfortable places.

Notwithstanding the fact that a closed tube is the most economical (from the strength-weight standpoint), reliable, and determinate section with which to take compression loads, and avoids *edges*, which, in duralumin, give us lots of worry, it is a bad thing to which to rivet, as the rivet heads inside cannot be inspected.

Flying Boats

Dornier, who builds flying boats and land-type airplanes, convertible as seaplanes, locates his wing above the fuselage, usually with some gap between. His wing is not tapered either in plan or depth. It is braced externally by long struts attached to the bottom of the fuselage, one leading to each of the two main wing beams. These reduce by half the length of the cantilever. For normal flying loads, these struts are in tension. Being long columns, they are weaker in compression to take reverse loads, but the reverse loads are of far less magnitude than the normal loads. His two wing beams and other important highly stressed parts are of formed heat-treated alloy steel. He uses flat thin-sheet duralumin skin to take stresses from drag and other loads. The skin is stiffened by channels or flanged U-sections, laid at right angles to each other. The channels lying in direction of flight are riveted outside the skin, top and bottom, and take the place of the compression cap strips in our old-fashioned ribs. Thwartship channels are riveted inside the skin. His airplanes are covered all over by duralumin sheets, except the ailerons, where he uses fabric to reduce weight and static hinge moment, thereby reducing the danger of wing flutter.

On his flying boats lateral stability on the water is obtained (?) by streamline sponsons built out from the main hull. On the Super-Wal two engines are mounted in tandem above the center of the wing.

Both the Super-Wal and Rohrbach's latest flying boat have succeeded in getting off the water with a useful load greater than the weight of the empty machine with power plant.

Rohrbach, who specializes in rather large flying boats, has evidently given a great deal of attention to the reduction of production costs. This has lead him toward an adaptation of shipbuilding practice.

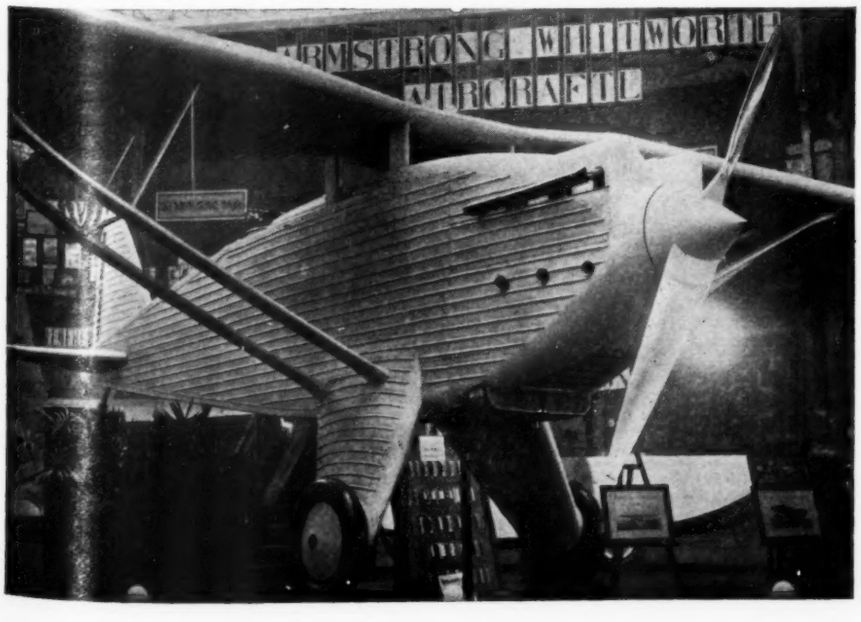
His monoplane wing is cantilever except that, by means of two tightly strung wires leading down and inboard from a station about half-way out, he imposes an initial bending moment and stresses on the inboard part of his wing girders of the opposite nature to those imposed in normal flight, thereby reducing the latter. In spite of the fact that the wing is well above the hull, he has chosen to use a very strong dihedral. At first glance one would say that the resulting lateral stability would be so great that maneuverability would be poor. He has stated, however, surprisingly enough, that this dihedral is necessary *to reduce instability*, thereby, of course, improving maneuverability. Until very recently his wing has been without taper in plan, but now, we hear, he uses some taper. His wing loading is extraordinarily high.

His study toward reducing production costs has been along the lines of dividing the wings and other major parts into a great number of separate units. He finishes fabrication of each of these, which permits a great number of men to work without getting in each other's way, and makes the final assembly very simple. Comparatively unskilled labor may be used.

For example, instead of building two wing beams, attaching a lot of ribs, and then applying a covering on this skeleton, he does something like this: The wing is divided into three parts by planes perpendicular to the chord and extending athwartship. The prime structural part is a sort of box girder and includes what we ordinarily call our two wing spars, together with drag bracing, and everything that is located between the two spars. The rounded entering-edge and the trailing-edge sections are built up separately and bolted in place in final assembly. These are readily removable for purposes of inspection and repair. All parts of the wing are of flat sheet metal, with angle sections for mutual attachment. The prime structural box girder is like a long thin caisson or tank, made up, following his principle, of a number of sections, covered top and bottom with comparatively thick imperforate duralumin sheet which serves to resist drag loads. At front and rear are his "wing spars," each made up of a web member and chord members. The web member is of heavy sheet with lightening holes which provide access to the inside of the "tank" for riveting and inspection. The chord members of the individual spars are double angles to which the skin, top or bottom, is attached. Between the four walls of the "tank," extending fore and aft, are a number of fore-and-aft "baffle-plate bulkheads" each of which takes the place of the web of the central portion of an old-fashioned rib. These also are of flat sheet with lightening holes. All these parts are built in sectional units and then the entire box girder riveted together by angle and channel pieces.

Holland

The Fokker Company has adhered to the practices which it originated and which it has found successful through many years. The wings are cantilevers, tapered in plan form and depth from root to tip. The cantilever principle is used



The AVIMETA AVM 88, a two-seater fighter with 595 hp. Hispano-Suiza engine. The machine is built entirely of the Schneider light alloy "Alferium" and has an excellent performance.

The Handley Page Hamlet four-passenger cabin plane equipped with three 120 hp. Bristol Lucifer air-cooled radial engines. The open leading and trailing edge slots of the Handley Page wing are clearly visible.

builds its structures of very thin high-grade steel sheet, with sections so formed and riveted together as to resist local buckling failures.

The development of La Cierva's "Autogiro," invented in Spain, is evidently being encouraged to some extent. In this machine vertical lift is obtained, not by flexed wings, but by four monoplanes above the fuselage rotating propeller-wise about a vertical axis. Rotation is started by external power before take-off and continues due to the nature of precision of air forces, during revolution, on this peculiar airscrew, as long as there is relative air velocity. The machine is propelled through the air by a conventional tractor propeller-motor unit mounted in a standard fuselage with tail surfaces. Due to relatively high "tip" velocities of wing blades, the airplane can take off and land at comparatively slow true air speed, with resulting short run. The gyroscopic effort of the mass of the rotating wings, with large diameter, tends to stabilize the machine in the air. It is very doubtful, however, whether this machine will compare favorably with an airplane with fixed wings, when it comes to carrying a given load a given distance with given power *in a given time*.

Handley Page has been developing, for a number of years, "slots" for wings. The auxiliary entering edge vanes and trailing edges of wings to form these slots may be opened and closed during flight. The purpose is to delay discontinuity of air flow above an airfoil, or "burbling," with resultant loss of lift, until a very high angle of attack has been reached. The result is that a given airplane, with given wing area, can land at a given speed with about sixty per cent more gross weight (perhaps over a hundred per cent more pay load) than it could without the slots.

France

France has built a tremendous number of military airplanes. Tourists in Europe may hold that the experienced constructors of France have built so many military machines that they can never learn to build *comfortable* passenger transports.

French airplane ideas are well diversified. Many of their modern machines are "sesquiplans"—with a wing and a half—the upper plane having a much greater spread, and usually greater chord, than the lower. The famous Breguet XIX, which has flown 3400 miles cross-country without landing exemplifies this type. There are also many monoplanes braced externally by a single pair of tension-compression struts extending diagonally out from the bottom of the fuselage. This very attractive type was developed by Loening in the United States and by the Morane-Saulnier Company in France. The Wibault is a very interesting French machine of this type—an all-metal monoplane of rather simple construction covered by thin sheet "Alferium." In his latest machines Wibault uses no wires, all loads being taken by compression-tension members.

French engineers seem to have no fear of the "rack and ruin" from landings. This is evidenced in three ways: (1) The very small travel shock absorbers; (2) The tendency to attach important structural members for wing bracing to the undercarriage; and (3) The general lightness, even flimsiness, of the structure throughout the airplane—ill-suited, one would think, to withstand the racking incident to hundreds of landings—average landings as we know them in this country. It may be that all French pilots are artists at landing, or that they are expected to land only on fine fields, or it may be that French engineers have learned how to make structures very flexible and shock absorbing and yet strong and durable. Or perhaps the military are willing to sacrifice an airplane every so often in order to save weight and the last word in performance. At any rate the French school in this respect is far different from ours.

The Société d'Emboutissage et de Constructions Mécaniques has installed a large equipment of special machinery toward reduction to real production methods. Their construction is largely of stamped sheet metal in shapes and combinations which look expensive but may not be.

Germany

There is no more interesting development than that in Germany. Restrictions imposed by the Allies after the armistice made it illegal for Germany to build airplanes which even remotely resembled military machines. Certain other restrictions at that time put a premium upon getting the most out of a limited amount of horsepower. These rules have forced German engineers into lines of endeavor which may result, within the near future, in Germany's leading the world in commercial aviation. Their airplanes are, from the time of first conception, designed with the sole thought of commercial utility. Except in a few instances, the general design schemes of other so-called commercial airplanes are modifications of those of previous military machines. Furthermore, German engineers and scientists have been forced into a deal of fundamental research, at which there are none more thorough and systematic, in aerodynamics and in the development and use of suitable materials.

The most successful engineers today, Dornier, Rohrbach, Junkers, and others, apparently agree on at least two important principles, viz., (a) the monoplane, and (b) the stressed skin or covering of thin duralumin sheet.

Junkers has always used his skin, on wings, fuselage, and other surfaces in the corrugated form, which has a distinct advantage in resisting "drum head" vibration and resulting fatigue failure at rivet-attachment points. Corrugated sheet has of course the added advantage of being capable of taking compression loads in, and bending loads normal to, the direction of the corrugations. It has, however, no rigidity in the other direction, is hard to work in such manner as to give a neat appearance where it is necessary to change to a "flat" along edges, and there is some question as to the efficiency of rivets as they must be pitched in a curved surface. Junkers has preferred the straight cantilever wing, strongly tapered both in plan and depth, usually located at the bottom of the fuselage with considerable dihedral. In this cantilever he has not used prime beams but, rather, has replaced chord members by a number of round seamless duralumin tubes, distributed throughout the entire wing sec-

in biplanes as well as monoplanes. The wings are entirely of wood, the two main spars being a box section with laminated-spruce chord members and double plywood side webs, with vertical spruce members placed vertically within the box at proper intervals, and all glued, screwed, and tacked together. The ribs and covering are also of plywood, the covering taking all drag loads and eliminating the necessity for internal drag trussing. The structure of fuselages is entirely of welded seamless steel tube, the forward portion usually in the form of a modified Warren truss and the rear portion a Pratt truss, with diagonal wires as tension members. Fokker machines have always been noted for their ease of control and stability.

United States

Briefly, in our country we build military biplanes, usually externally braced, sesquiplanes in our single-seater pursuits, and many monoplanes for commercial uses. Our fuselage structures are tubular, usually welded seamless steel, but sometimes duralumin. Our wing spars are usually of spruce, and our covering of doped cotton.

The particular phase of aviation in which we, without argument, stand at the head of the world is our Air Mail Service, which operates at night over bad country and in all sorts of thick weather. Our Air Mail Service has been, in this work, remarkably successful, largely due to the pilots and to the efficiency of ground maintenance service. However, one cannot help believing that, even with the installation of light beacons, emergency landing fields, etc., our air-mail pilots, in their efforts to keep up their fine record for reliability, are still operating under conditions which are prohibitively hazardous. A lot must be done yet toward protecting them. It has been suggested that, for night flying in thick weather across bad country, a string of "Neon" tube lights, spaced at intervals of about 300 yards along the entire course, might go far toward solving the problem, but one wonders, when contemplating the cost of light beacons, landing fields, wrecked airplanes, radio installations, meteorological services, etc., whether there may not be some other way more reliable, less costly, and *less hazardous to human life* than our present transcontinental Air Mail Service, which is getting more and more complicated as we learn more about it.

The airplane has the peculiar great inherent advantage of being able to travel swiftly at any time in a straight line from any one place to any other. But when we have a set route such as the New York-Chicago-San Francisco line, perhaps some such means as a streamline container, with no wings, riding on an overhead cable, with or without motorman, propelled by electric motor or by airplane propeller-motor unit, might be better, all things considered.

Power Plant

There has been, since the war, great development of, and an encouraging degree of confidence in, air-cooled engines. The most popular of these are of the fixed radial arrangement, usually nine-cylinder, one piston having a master connecting rod, with the other eight rods connected thereto, all to one crankpin. The Bristol "Jupiter," developed in England and built in large numbers, under license, in France, and the Pratt & Whitney Wasp in the United States, have proved that 450 hp. is practical in a unit. For this horsepower the radial air-cooled engine appears to be the lightest type, when means of cooling are included. How much more power it is good to take through one crankpin must be proved.

The inverted "V" and "in-line" arrangements, which have certain advantages, have proved practical.

The Napier Lion in England and the Hispano-Suiza "Broad-Arrow" in France are fine examples of "close-coupled" water-cooled engines. Each has twelve cylinders, arranged in three banks of four. Italy, with her "Schneider Trophy" Fiat has shown that it is possible to get 900 hp. for 900 lb., exclusive of cooling system.

All these engines are essentially for military use, however. Cost of construction, operation, and maintenance, which must be paramount for commercial uses, have been neglected.

Division of Power Plant

There are those who argue that in using more than one engine we are only admitting weakness in power-plant reliability or in lack of landing fields. This is true, and it may be that the day is almost here when confidence in our power plant (engine proper and ignition, lubrication, fuel supply, and cooling systems) and in having a landing field always fairly handy, will have grown to the point where we shall willingly put all our eggs in one basket. The compromises in the multi-engine arrangements are many. Parasite air resistance increases badly, engine controls and fuel-supply systems become complicated, and often we must have several rudders in order that at least one may always be in the slip stream of the propeller that's turning. There is, of course (except in the case where it is necessary to provide proper fields of vision for a bomber), no excuse for division of power plant unless the airplane can fly with one engine out, and it is very confusing and discouraging to try to calculate a proper business-like airplane that can really fly, with full load, with one engine out. What we are after, in commercial aviation, is to carry the greatest number of pounds a given distance with the minimum of horsepower. When we reduce the load carried by an amount such that the airplane can really fly with half, or a third, of the power gone (more than that, really, because of reduced propeller efficiency with engines full out at reduced air speed), we are not carrying enough load per horsepower installed to be operating economically.

Summary

As proof that the science is yet fluid, the author cites the following:

England has no welded structures; we use little else in our fuselages.

Fokker developed the welded steel-tube fuselage structure in Germany and still uses it. We in the United States followed him, but Germany did not, nor has any other nation.

France has wooden fuselages and wings of metal structure; we have metal fuselage structures and wooden wing structures.

England uses little duralumin, Germany little else, France some, we less.

England is for biplanes, Germany for monoplanes.

England's biplanes have thin wings with, usually, two-bay cellules. Our biplanes are usually single-bay, with moderately thick wing sections.

Several types of monoplanes are in use: (a) The pure cantilever, tapered in plan and in depth (Fokker); (b) The cantilever with Rohrbach's wires under initial tension; (c) The semi-cantilever, with constant chord and depth, braced underneath by diagonal tension—compression struts (Dornier); (d) The semi-cantilever, with diagonal struts, with taper in depth and diagonal or chord from root to tip. There has been a leaning toward type (3) in France, Germany, and, lately, in the United States.

Noctovision

"Noctovision", which its inventor promises will pierce fog and smoke, was demonstrated recently in London. John L. Baird, the inventor of television, is also the inventor of this new ray. It is an invisible searchlight which, it is claimed, has sixteen times the penetrative power of ordinary light through fog or smoke. The ray is said to make a sound when it encounters a solid object or even a ray of light. Each object produces an individual sound, thus enabling the sender to determine its nature—or rather, so the report says. Whether or not this new invention has any aeronautical significance is another question.

Plans Progress For Trans-Atlantic Flight

Chamberlin and Bertaud to Fly Bellanca Plane
French Levasseur and Farman Planes to Attempt

PLANS AND preparations for the Paris-New York flight of the Bellanca plane, which will be piloted by Lloyd Bertaud, are going forward rapidly. The injury to the wing strut, sustained when Clarence Chamberlin skillfully brought the plane to earth with the undercarriage damaged, has been repaired. John Carisi, superintendent of construction for the Columbia Aircraft Corp., and Andrew Farini, mechanic, put the plane into shape, under the supervision of G. M. Bellanca. The strut was rebuilt at the factory of the Curtiss Aeroplane and Motor Company, Inc., Garden City, L. I.

It will be recalled that on the afternoon of Sunday, April 24, after Miss Eloyse Levine, the daughter of Charles A. Levine, chairman of the board of the Columbia Aircraft Corporation, had christened the plane "Columbia", she and Miss Grace Jonas, daughter of Ralph Jonas, president of the Brooklyn Chamber of Commerce, which is sponsoring the proposed flight, flew with Clarence Chamberlin, the pilot, and John Carisi, the mechanic, in the machine. During the take-off, the plane hit a peculiarly bad bump on Curtiss Field and damaged the socket of the left compression strut on the undercarriage. While the wheel did not actually come off, it was considerably caved in and the entire structure too much weakened to sustain the plane on landing. While this was unknown to the occupants of the machine, the observers on the ground, realizing immediately the danger, made preparations to inform Chamberlin of the condition of his undercarriage.

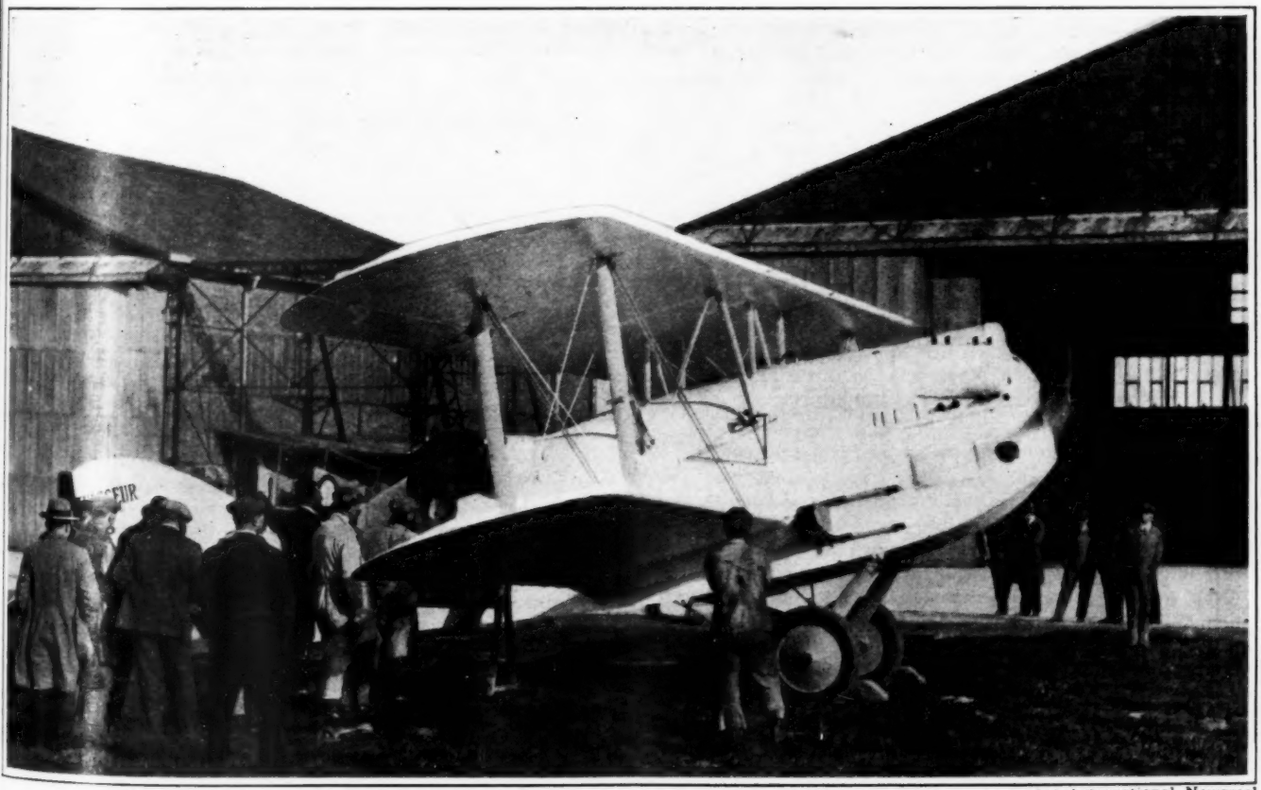
W. H. McMullen, of the Curtiss Flying Service, and R. G. Shults, of the T. D. S. Aerial Service, immediately went up in an Oriole, carrying a wheel which had been wrenched from a dolly and, flying alongside of the Bellanca plane, indicated with the aid of the wheel the condition of the undercarriage of the damaged machine. Tense moments followed while Chamberlin and Carisi conferred as to the steps to take to ensure the safest possible landing, under the circumstances, and at the same time allay the fears of the two children in the plane with them. During the succeeding half hour or so, while the plane was circling Curtiss Field, three sandbags were dropped with a view of lightening the load in the plane, much to the consternation of the police officers on the field who dashed for the sandbags.

Realizing that a landing on Curtiss Field would present unnecessary hardships, owing to the vast crowds, the fliers first decided to land at Roosevelt Field, but at this moment M. M. Merrill, also of the Curtiss Flying Service, took off in an Oriole, on which the words "Land at Mitchel" were chalked in large letters.

Chamberlin, with his usual piloting skill, made a perfect landing without even shaking up his passengers. The caved-in wheel, however, collapsed and damaged one of the left Bellanca wing struts.

Feeling that it would take too long for instruments to be delivered from the factory, mechanics have taken a whole set of Pioneer instruments from the Pioneer Company's Travel Air plane, which won the Reliability tour last year, and have installed them in the Bellanca plane. These instruments include everything necessary for a long-distance flight.

As well as taking over the New York-Paris flight project of the Bellanca plane, the Brooklyn Chamber of Commerce



(c) International Newsreel.

The single-engine Levasseur plane (450 hp Lorraine-Dietrich) on which Captains Nungesser and Coli will attempt the Atlantic flight from Paris. The bottom of the fuselage is so designed as to render a forced landing on water possible without the danger of capsizing the plane. The undercarriage is detachable and Vee entry of the underside of the nose of the fuselage will be noticed.

Aero Dopes and Varnishes*

The Chemistry of Dopes for Aircraft Fabric and How Problems of Weathering and Fireproofing have Been Overcome. The Dope Manufacturing Process.

By H. T. S. BRITTON

DURING THE earlier period of the War, and before the problem of procuring solvents and diluents in vast quantities demanded by the rapid increase in aircraft construction had become acute, it was customary to apply five or more coats of dope, the last one or two of which were sometimes pigmented, and then to finish off with a coating of a transparent oil varnish. The first coat was brushed on with a specially diluted dope, containing about 6 grams of cellulose acetate per 100 c.c. of solvent mixture, whereas the subsequent coats were applied with a full-strength dope containing about 9 drams of cellulose acetate in every 100 c.c. of solvent mixture. In order that the amount of dried dope film did not greatly exceed 2 ounces per square yard, a cellulose acetate giving a lower viscosity dope was used. The idea of using a dilute first coat dope was to ensure thorough penetration of the dope into the fibres of the linen fabric. This doping scheme was, however, very extravagant in solvents and ultimately gave way to a scheme, advanced by the British Air Ministry, of three coats, not including protective coatings, in which full-strength dope was used for every coat, the concentration of cellulose acetate being kept about the same as in the earlier schemes, but a cellulose acetate was used which gave more viscuous solutions, whose viscosities were about 40-50 per cent of glycerol at 25 deg. C.

Before proceeding to discuss the preparation of dope solutions, it will be necessary to consider some of the essential properties which should be possessed by a dope film, deposited in and on the surface of an airplane fabric. The first is that it should tauten the fabric and maintain it in a "drum-tight" condition. Needless to say, flabbiness of the fabric on airplane parts may interfere very considerably with the safety and efficiency of an airplane. Secondly, it should withstand weathering with its changes, often sudden from hot to cold and from wet to dry. Thirdly, it should protect the fabric deleterious light effects.

The brushing of a cellulose acetate solution on to a fabric, which has been evenly attached to a wooden framework, will, on drying, produce a taut cellulose acetate film in the meshes of the fabric. This film will become brittle when the last traces of solvent have passed off. Brittleness can, however, to a great extent be avoided by the inclusion in the dope of a solvent of cellulose acetate whose volatility is very low, *i.e.*, one with a high boiling point, and which consequently remains in the dried dope film. In the early days of dope manufacture tetrachlorethane was used as a solvent and this gave a tough film and one which withstood the effects of the dry weather fairly well. Its low volatility enabled much of it to be retained on drying. This solvent, acting as it did as a "softener," proved unsatisfactory in wet weather through the development of hydrochloric acid which destroyed the fabric and probably the cellulose acetate as well, at any rate, the surface soon became a network of cracks and especially if the planes were pressed with the finger. This, coupled with the poisonous effects of tetrachlorethane on the dope operatives in promoting a type of jaundice which, in some cases, resulted in death, led to its early abandonment. It was found at the Royal Aircraft Establishment (Advisory Committee for Aeronautics, Reports and Memoranda No. 498, 1915, published 1919) that benzyl alcohol could be used with greater success than tetrachlorethane. Its high boiling point, 200-213 C., and its solvent property caused it to be retained in the dope film for a considerable time under ordinary weather conditions, though its volatility became apparent when it was incorporated in dopes which were used on airplanes in Egypt, where the temperature changes were greater. The superiority of benzyl alcohol over tetrachlorethane in acetyl dopes may be seen from the results of weathering tests after exposure for 50 days. In the case of tetrachlorethane dope, the loss in tensile strength was 32 lb. per inch width of fabric, whereas in the case of the benzyl alcohol dope the loss was only 12 lb. per inch. The addition of too much benzyl alcohol to a dope gives rise to an appreciable reduction in its tautening property. It has also a marked effect on its viscosity, as the following figures will show, which illustrate its effect on a typical dope, containing 8.5 grams of cellulose acetate in 100 c.c.

TABLE I.

C.cs. Benzyl Alcohol.	Viscosity at 25° (Glycerol = 100).
0	65.1
2	53.2
5	48.5
10	42.8
15	37.1

As is well known, linen and cotton fabrics undergo variations in dimensions in wet and dry weather, and even though the fabric may have been covered with dope, yet these changes still go on, though perhaps not to so great an extent. Similar effects are observed in hot and cold weather. Thus, doped fabrics on airplanes will undergo great changes in tautness, and in the case of moist, cold weather may become so flabby as to incapacitate the airplane. The great difference in temperature between the day-time and night in Egypt caused the tautness to suffer extreme variations, and this had weakening effects on the structural parts of the airplane. Benzyl alcohol in the dope used did not give the best results, for it tended to promote a tautness which was directly dependent on the weather. Dopes, however, which contained triacetin (glycerol triacetate), though not giving quite such a high degree of tautness, gave a coating which underwent less variation. This is remarkable, for it has a lower boiling point, 169-172 deg. C., than benzyl alcohol.

Another agent which was found to plasticize the dope film was triphenyl phosphate—a crystalline solid melting between 45-48 deg. C., and having a sufficient, though slight, solvent action to prevent it from crystallising out in the dope film, and thereby to cause disintegration. Trieresyl phosphate, which is widely used as a plasticizer in the movie film industry, does not appear to have found favour in this country as far as dope was concerned, probably because of its tendency to cause "whiteness" through its lower solvent action for the particular quality of cellulose acetate used in dope. Triphenyl phosphate does not alter the tensile strength of a dope film, but permits it to undergo greater elongation before being ruptured. This was proved, as shown in Table II, by preparing a series of dope films by brushing several coats, each succeeding coat at right angles to the previous one, of dope containing varying proportions of triphenyl phosphate to cellulose acetate on to squares of plate glass and afterwards stripping off and ascertaining the tensile strength of strips cut from them 1 in. in width, 7 in. of film being placed between the jaws of the machine.

The proportion of triphenyl phosphate to cellulose acetate which is usually found in dopes is about 1 : 6. Thus, the formula of the Air Ministry for acetyl-cellulose dope required

*The Industrial Chemist, London, Eng., March, 1927.

has announced that it will give $15,000 to the pilots if they succeed in making the hop. The danger of ice off Newfoundland and possibly further out at sea has led Lloyd Bertaud to plot a course further south than the usual one chosen by pilots as the shortest flight across the Atlantic. The course will follow the earth curve, but will probably not go as far north as the fifteenth degree of latitude. This will not increase the flying distance to any great extent.

The question as to whether Clarence Chamberlin or Bert Acosta would accompany Lloyd Bertaud on the flight, which had been causing much speculation, was summarily disposed of by Bert Acosta himself in a letter which he wrote on April 27 to Charles A. Levine. In relinquishing his place in favor of Chamberlin, Acosta said that he felt that the sixty pound difference in weight between Chamberlin and himself made the selection of the former an advantage that would materially advance the possibilities of success. He also paid a tribute to Chamberlin's ability as a pilot.

The Levasseur plane, which Capt. Charles M. Nungesser and Capt. Francois Coli will use in their attempt to fly across the Atlantic has been delivered to the French Army airdrome at Villacoublay and has undergone several tests. Captain Coli has tentatively planned his course as follows: Paris, Point de Honfleur, Point de Cherbourg, Lands End, England, Bray Head, Ireland, northward to a point of longitude 30 west from Greenwich, latitude 54 north, thence south to the southernmost point of Newfoundland, Cape Race, reaching the American Atlantic coast near Boston and then to New York.

In order to give ample room to the pilot, the seating arrangement of the Levasseur plane has been altered. It originally had three seats, one behind another, but the first will be removed to make room for gasoline tanks. The plane will have a total weight of 11,000 lb. This includes the instruments and the 985 gal. of fuel necessary to make the flight. In order to save weight, it is probable that there will be no wireless on the plane.

Lieutenant Drouhin, a French pilot, has added further to Trans-Atlantic flight interest with his announcement that he too would compete. He will fly a 1000 hp. Farman Gollath biplane. The biplane is 24 ft. by 60 ft. and is modeled after the well-known Goliath type already associated with the Farman constructors. Instead, however, of the two engines being placed outboard on the wings, they are placed in the middle of the plane, one in front of the other—tractor and pusher.

Renewed impetus was given the Atlantic flight project by the arrival in New York on April 27 of Capt. Rene Fonck, the French pilot, whose Sikorsky plane is being completed at the company's factory at College Point. He brought with him two new engines for installation in the new Sikorsky plane in which he expects to fly across the Atlantic in September. Captain Fonck said his flight was not so much for the Raymond Orteig Prize, but for the scientific value such a flight would have. He declared he would attempt the flight regardless of the prior success of any other pilot.

At the time of going to press the preparations for the Trans-Atlantic flight of the Bellanca airplane have been going forward in a very satisfactory manner at Curtiss Field, Garden City, New York. Since the successful completion of the fifty-one hour endurance record flight on April 14, alterations and tests have been rushed under the supervision of the designer, Guiseppe M. Bellanca, and his superintendent, John Carisi. A number of flights have been made daily, regardless of weather, by pilot Clarence Chamberlin, for the testing of instruments and for efficiency tests on the various gasolines which are being pushed by enterprising refining companies. The only hitch in the proceeding,—the dropping out of a landing gear strut after taking off on Sunday, April 23, with three passengers,—ended very fortunately because of the very skillful one-wheel landing of Chamberlin. Chamberlin, and Carisi, who was one of the passengers on that flight, have gone up in the estimation of every one who has been following the preparations for the Trans-Atlantic trip, because of their handling of that very dangerous situation.

Most of the following data concerning the characteristics of the machine when it will be ready for take-off was obtained from Mr. Bellanca at the field.

The full load weight of the machine will be 5400 lb. which can be compared with reported weight at take-off for the duration flight of 4930 lb. With that load (4930 lb.) at the start of the duration flight, the plane took off in 26 sec. with a run of 1200 ft. The total wing area is 272 sq. ft. which indicates a wing loading of a little less than 20 lb. per sq. ft. as compared with a loading of slightly more than 18 lb. per sq. ft. for the duration flight. The Whirlwind engine which will be used is rated at 220 hp. at 1800 r.p.m., giving a power loading of approximately 24.5 lb. per b.hp. compared with a power loading of approximately 22.5 lb. per b.hp. for the duration flight. The combined loadings, which are usually taken to give a true indication of the flight conditions, are 44.5 for the proposed Paris flight and 40.5 for the duration flight.

Mr. Bellanca contemplates no trouble in lifting this full load but is making all possible preparations to safeguard the pilots and machine. Ruts in the take-off field have been filled in or smoothed out and it is probable that men will be placed in positions on the field at which the pilot should cut off power if he has not cleared. The section of the gully which is located at the end of the runway has been graded off to the lower Curtiss Field, so that it will not be necessary to ground-loop the plane if it fails to clear on the first attempts.

The gasoline to be used has not been selected at this time, as efficiency tests are still in progress, but it has been decided that 430 gal. will be carried. A tank in each wing root holds 32.5 gal., making 65 gal. in the wings, and the main tank in the cabin carries 330 gal. The balance will be carried in five gallon cans, from which the other tanks will be replenished as the fuel is used. Three-way valves connect these tanks and fuel may be transferred from one to the other by means of an engine driven pump or hand operated wobble pump. The oil will be Mobiloil, and twenty gallons will be carried. No life rafts or other flotation gear will be taken as the main tank is provided with a dump valve which may be opened to dump the fuel, and then closed to provide buoyancy in the event of an emergency landing on water. This dump valve has a 3 in. diameter gasoline outlet and a 2 in. diameter air inlet, which can empty the tank, when full, in 55 sec. Numerous experiments have shown that in designing dump valves for tanks, the usual designing error has been in providing a too small air vent, but this combination on the Bellanca plane seems to be a satisfactory one. An average speed of 108 m.p.h. will be attempted, which will give a higher gasoline consumption than prevailed during the duration flight. In that flight the initial consumption was 10 to 11 gal. per hour tapering off to 5½ gal. as the load was decreased, making an average of 7.7 gal. per hour.

Openings will be made in the top of the plane from which Lloyd W. Bertaud can operate his sextant and other navigating instruments. In addition to these navigating instruments the following will be carried, mostly of Pioneer Instrument Company manufacture, earth inductor compass, magnetic compass, bank and turn indicator, tachometer, altimeter, oil thermometer, oil pressure guage, and air speed indicator.

Other characteristics which may be of interest are: stabilizer and elevator area 40 sq. ft.; fin area 6 sq. ft.; and rudder area 13 sq. ft., of which area about 1½ ft. is in the balanced portion. Ailerons, unbalanced, have 12 sq. ft. of area each.

The wing tension struts, which are faired with about a fifteen inch chord, are unusual in that in take-off and stalling attitudes of the plane they give quite appreciable lift, but at high speed act merely as faired sections. These struts, of which there are two for each cantilever wing, have no tubes in their construction but are made from spruce planks.

is that dope on being brought from storage shall have ample time to attain to the temperature of the room. If the dope be cold, the viscosity will be much too great, and if too warm, too small. Fig. 1 shows the considerable change in the viscosity of a dope with temperature, and shows that a dope at 10 deg. C. has a viscosity of about double that at 25 deg. C. The application of dope at too high a temperature will also cause the coating to contain so many bubbles that the continuity of the dope film will be impaired.

Dopes used for covering airships are generally applied mechanically by a scraping motion to the fabric before it is attached, for which a highly concentrated, and, therefore, highly viscuous, dope is used. As the dope is to function mainly as a waterproofing agent, a larger proportion of plasticizers, such as triphenyl phosphate, is included.

The dope film which has been applied to the fabric of an airplane may give initially the necessary tautness and waterproofing, but after some time both the dope film and the fabric will begin to deteriorate. The softening agent, either benzyl alcohol or triacetin, will slowly evaporate from the dope film leaving it brittle, and in time the adhering film will tend to strip off the fabric. This evaporation can, however be prevented to a great extent by the application to the doped surface of a coat of suitable varnish. Linseed oil-rosin varnish affords satisfactory protection in winter weather, but in warmer weather the chemical action that goes on in the drying oil hardens the varnish coat, so much so that it may peel off, bringing the dope film with it. Tung-oil (Chinese wood oil) rosin varnish gives better results in all weathers. Perhaps the best covering yet found is a nitrocellulose varnish, the outcome of research at the Royal Aircraft Establishment, and known as V. 114. The varnish is rendered extremely supple by the inclusion of a good deal of castor oil. The following formula makes 100 gal.:—

Nitrocellulose syrup	250 lb.
Amyl acetate	17½ gal.
Castor oil	90 lb.
Meethylated spirit (66 per cent overproof)	21½ gal.

The nitrocellulose syrup contained 20 per cent by weight of dry nitrocellulose, not more than 10 per cent by weight of alcohol, and not less than 70 per cent by weight of either butyl or amyl acetate. V. 114 proved most serviceable when used on the under-sides of 'planes, but when used on the upper surfaces deterioration of the fabric still occurred. This is forcibly illustrated in Table III by some measurements of the tensile strengths of doped and doped and varnished (V. 114) fabrics after exposure to the weather for varying periods (*vide* Advisory Comm. Aero., R. and M. 498).

TABLE III.—TENSILE STRENGTHS IN LB. OF STRIPS 1 INCH WIDE.

(*a*) In winter months:—			
Days exposed	0	10	20
Dope	102	93	91
Dope+V 114	104	98	97
(*b*) After 52 days' exposure in summer:—			
Dope alone	39		
Dope+V. 114	41		
Dope+P.C. 1 0	91		

It will be seen that the deterioration did not take place at a great rate in Winter, but in Summer-time the loss in tensile strength of the doped fabric covered with V. 114 after 52 days was only slightly less than that of the doped fabric alone. The cause of this remarkable loss was traced to the ultra-violet radiations, and thus accounted for the deterioration taking place only in the sunny months (*see also* Aston, Advis Comm. Aero.; R. & M. 585). Table IV gives the results of tensile strength experiments, expressed in pounds per inch, of doped fabrics covered with various pigmented varnishes when exposed for different periods.

TABLE IV.

Days exposed	0	25	50	75
Covering:				
Dope	95	66	47	32
Dope + Dyed varnish	95	62	49	32
Dope + Blue pigmented varnish	95	62	53	51
Dope + Khaki pigmented varnish	95	80	76	75

These figures indicate that the greatest protection from the ultra-violet radiations was given by the two pigmented coverings; of these the khaki-coloured one was more efficient. This led to an almost general adoption of khaki pigmented varnish coverings for the upper surfaces; sometimes they were pigmented tung oil-rosin varnishes, and more often a nitrocellulose-castor oil varnish of the type of V. 114 in which was incorporated the pigments necessary to give a khaki hue. The following is the formula of this varnish, known as P.C. 10, to make 100 gallons:—

Nitrocellulose syrup	260 lb.
Castor oil	50 lb.
Methylethylketone or acetone	20 gal.
Butyl or Amyl acetate	15 gal.
Methylated spirit	15 gal.
Benzol	15 gal.
Pigments	74 lb.

e.g.: (Yellow ochre, 40 lb.; Umber, 30 lb.; Red ochre, 40 oz.; Chinese blue, 25 oz.)

These pigments were thoroughly ground with the castor oil in either a cone or roller mill and then mixed with the nitrocellulose mixture. As shown in Table III, it gives an excellent protection to the fabric.

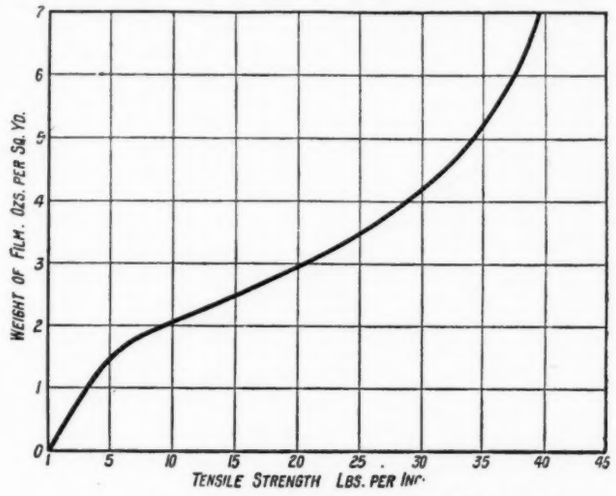


Fig. 2—Graph Showing Tensile Strength of Dope Films

The tensile strength of doped fabric in the directions of both the warp and the weft are in general a little greater than the sum of the tensile strengths of the fabric and the dope film alone. This may be due to the reinforcement which the adhering dope film gives to each individual fibre, for a piece of doped fabric under tension usually yields in an even break and not with an irregular tear, as is often the case with fabric. Fig. 2 gives an approximate measure of the tensile strength of typical dope films alone, strips of 1 in. in width being used.

TABLE V.—IGNITION TEMPERATURES.

Undoped linen	353° C.
Linen doped with acetyl	380° C.
Linen doped with acetyl + P.C. 10	375° C.
Linen doped with acetyl + pigmented oil varnish	390° C.
Linen doped with nitro, containing no fireproofing agents	200° C.
Linen doped with proprietary nitro containing fireproofing agent ($CaCl_2$)	195° C.

The question of inflammability of doped fabrics is one of great importance. Acetyl-cellulose dope films are almost uninflammable, due to the acetate itself and the triphenyl-phosphate. Nitrocellulose dope films, on the other hand, are highly inflammable, though airplane dopes are still being manufactured from pyroxylin in the form of used movie films. It should be stated that these dopes contain certain ingredients to reduce their inflammability, and it is probable that when airplanes are in flight neither acetyl- nor nitro-dope can burn, and the fact that wings have so burned must have been due to saturation with gasoline (Barr, R. & M. 573, 1919), and, therefore, one of the essential properties of the protective varnish coverings is that they shall be resistant to gasoline and also to hot castor oil, which is used as a lubricant. It is when airplanes are stationary that the nitro-dopes may exhibit their great inflammability. Table V gives the ignition temperatures of fabrics covered with various dopes when heated in a muffle furnace and are taken from the paper by Barr (*loc. cit.*).

15 lb. of triphenyl phosphate for every 85 lb. of cellulose acetate in 100 gal. of solvent mixture, 2 gal. of which is benzyl alcohol. The 98 gal. instead of being composed entirely of one of the better solvents, such as acetone or methyl acetate, as was the case in some of the earlier dopes, were to contain, according to the Air Ministry specification, 45 gal. of one of these solvents in dopes for use in Summer months, and 50 gal. for use in Winter months. The remaining 53 gal. (Summer months) and 48 gal. (Winter months) were made up of liquids which have by themselves practically no solvent powers, though they may materially improve the solvent capacity of the mixture as a whole, and are known as "diluents." This diluent mixture was made up of 26.5 gal. each of alcohol and of benzol for Summer dopes, but for Winter dopes the benzol preponderates, there being 28 gal. of it to 20 gal. of alcohol. Ethyl formate was sometimes used as a solvent and took the place volume for volume acetone. In Ethyl acetate both the Rhône and Spondon cellulose acetates appear to be insoluble, although the addition of alcohol permits of solution taking place. It has been suggested that it may be used to replace one-third of the acetone. Methyl-ethyl ketone, although not an ideal solvent for cellulose acetate, has an advantage in that it has a higher boiling point than acetone, and has therefore a somewhat reduced volatility was occasionally used to replace one-fifth of the volume of acetone. Another solvent sometimes used is that technically known as "methyl acetone," which is principally a mixture of methyl alcohol, methyl acetate, and acetone. If it contained no non-volatile material and was free from acidity, it could be used as a substitute for both solvent and alcohol in the diluent mixture, the methyl acetate and acetone replacing pure acetone and the methyl alcohol replacing an equal volume of ethyl alcohol.

TABLE II.

Weight of film per square yd. (oz.)	Triphenyl phosphate. / Cellulose acetate.	Cellulose acetate per square yd. (oz.)	Percentage Elongation (approx.).	Tensile strength. lb./inch.
4.42	0	4.42	7	32.4
4.92	0.1	4.50	9	33.8
5.64	0.25	4.51	11	34.0
6.90	0.50	4.60	15	36.9

At first sight the composition of the mixture of solvents and diluents may appear somewhat fantastic. It will be noticed that the solvents, acetone, methyl acetate, &c., have lower boiling-points than the two diluents used, and are consequently more volatile. A serious trouble in the doping of airplanes is that technically known as "whiteness." If dope is brushed on to planes in a humid atmosphere it will often be found that the dope surface on drying contains white patches or streaks, giving an opaque film and a rough surface. It is, in fact, cellulose acetate which has been precipitated from colloidal solution instead of drying to a continuous transparent gel. These patches are readily penetrated by water, becoming on weathering a network of cracks, and, moreover, reducing considerably the tensile strength of the fabric. The cause of this "whiteness" is often due to the precipitating action of water, though too large an amount of alcohol or benzol will do the same thing. To avoid this trouble arising from the dope itself, every precaution should be made to use only those materials which contain no water or only such quantities which will have no such deleterious effect on the dried film. The trouble usually arises through insufficient precautions being taken to control the humidity of the doping shops, which can be done by suitable control of their ventilation and heating, for a doped surface on drying tends to become cold through the extraction from it of latent heats of vaporisation of the liquids, and its temperature may therefore fall below the dew-point, with the result that water condenses on the surface and precipitates some of the cellulose acetate in the form of "whiteness."

As mentioned before, both alcohol and benzol, when used alone as diluents in conjunction with either acetone or methyl acetate as solvent, behave to varying extents as precipitants; using alcohol alone, the dope itself is opaque and white, whereas with all benzol a part of the cellulose acetate remains in clear solution and a part fails to dissolve. With equal volumes of the two diluents a clear solution is produced and nearly so with a 1 : 3 mixture, but not with a 3 : 1 mixture. The solvent influence of benzol appears to be greater than that of alcohol. Those dopes which were clear had greater viscosities and gave films of greater tensile strength. Furthermore, the dope film deposited on fabric when dried under suitable conditions showed no "whiteness" in the case of dopes containing 1 : 1 and 1 : 3 alcohol-benzol mixtures. These proportions represent the limiting proportions of alcohol and benzol which can be safely included in dope.

Dopes manufactured in accordance with the Summer formula contained diluents in the quantity and proportions which only just prevented the formation of "whiteness" and therefore did not allow of any absorption of water, whereas the extra solvent and greater proportion of benzol to alcohol in the Winter dope rendered possible a greater absorption of water before "whiteness" was produced under good doping conditions. Thus, it was found that Summer dopes, prepared from materials which had satisfied the Air Ministry specifications, could absorb moisture to the extent of about 0.5 per cent, but if the ingredients happened to be anhydrous about 3 per cent could be absorbed. If one-fifth of the solvent, however, were methyl ethyl ketone, the dope permitted of still less water absorption. The Winter dope did not produce "whiteness" until 6 per cent of water, using anhydrous constituents, and 4 per cent, using approved materials, had been absorbed.

The manufacture of acetyl dopes is not a matter of great difficulty. Any type of mixing machine may be used, whether it be a revolving barrel or a metal or wooden cylindrical vat containing baffle plates and rotating paddles. The cellulose acetate often requires much time for complete solution, through the formation of gelatinous layers on the surfaces of lumps of the acetate which thereby impede the penetration of the solvent. This can sometimes be prevented by agitating the cellulose acetate with the diluents in order to get the material well disintegrated before introducing the solvent. If, on the other hand, it is attempted to get the cellulose acetate to dissolve first in the solvent, before adding the diluents, the resulting extremely viscuous solution will exert an excessive and perhaps disastrous strain on the paddles.

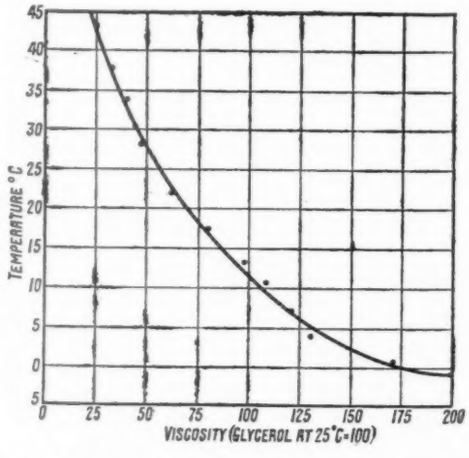


Fig. 1—Change of Viscosity of Dope with Temperature

The temperature of a dope shop should be between 70 deg. and 75 deg. F. and care should be taken to keep the humidity of the atmosphere at a minimum. The fabric should be quite dry and should contain the least possible quantity of dressing, the only lubricants permitted in sizing the warps of the linen fabric being pure tallow, pure palm oil, or pure Japan wax. If any unsaponifiable matter be used, such as paraffin wax, the dope will not adhere satisfactorily to the fabric, but will give a "bubbly" surface. Another point of importance

Side Slips

By ROBERT R. OSBORN

The aviation industry seems to be developing a new price system, in advertising its engines and planes for sale at very attractive prices "less magnetos, propeller hub and nut, and carburetors" or "less engines, landing gears, propellers, radiators, wings and windshield". The new idea seems to be to keep the price constant and take care of fluctuations by varying the quantity one gets for the money. A conversation along aeronautical lines in the future might be somewhat like this—

"I see that the Whoozis Airplane Company has reduced the price of its ship a radiator, a left lower wing and two ailerons."

"Yes, but I can get you one through a dealer friend of mine at least a landing gear and propeller cheaper than that. He gets them right from the factory with almost enough parts on the ship to fly it. I bought a new engine from him last week with all of the cylinders in place,—of course it didn't have any camshafts, pistons or connecting rods, but I certainly was lucky to get one with a full set of cylinders."

* * * *

The Intrepid Aviator was in to see us again, after his extended cross-country trips, and says it isn't any wonder to him that the Handley-Page slots have not been installed on many machines over here. He says he was flying over lots of country where he'd hate to be running out of gasoline, and no quarter to put in the slot for more.

The Aeronautical Chamber of Commerce, in its recent report on commercial aviation, has a long list of articles which have been carried by aerial services,—advertising copy, asbestos suits, auto repair parts, bank drafts, bills of lading, jewelry, machinery, orchids, stocks and bonds,—and so on. We think that as much publicity as possible should be given this list—to prevent any more claims for having carried any of these articles for the first time in history. Hardly a week passes by but that some one claims to have delivered an electric stove for the first time in history, and if the same group of fliers should start delivering articles from this list, it might take ten years to complete it.

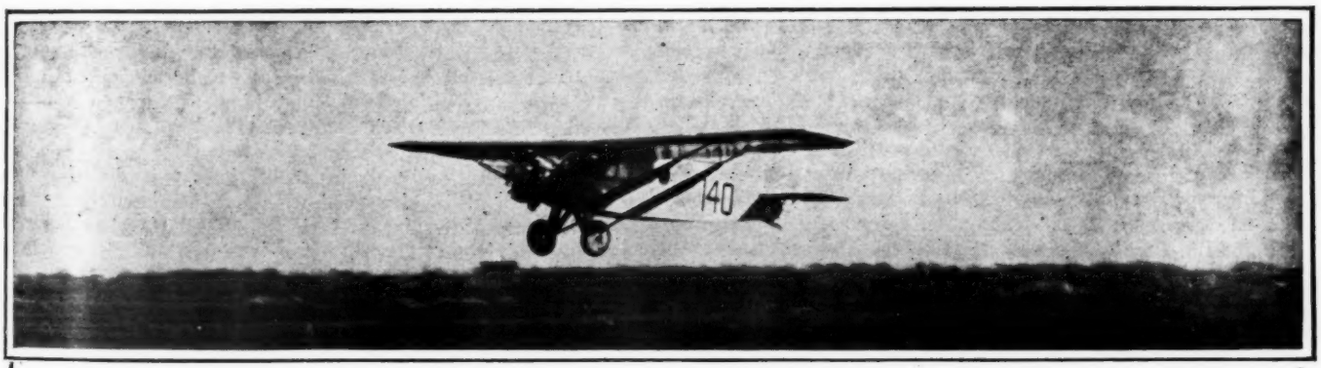
* * * *

Sometimes we think Commander de Pinedo takes some really unnecessary chances. The statement credited to him, concerning the licensing of women as commercial pilots in England, causes us to have grave fears for his personal safety. He is quoted as having said that he wouldn't go up in a plane which had a woman at the controls,—"I may be wrong, but I have seen them drive automobiles. Perhaps I am superstitious. There are good women pilots, but I wouldn't tempt fate."

It may be all very well to take chances on forced landings at sea, in jungles and mountainous country, and on visits to strong anti-Fascist sections of the country,—but we can only hope that the genial commander's wind is in good condition after a statement like this, as he may have to outrun a mob of indignant women.

* * * *

We suggest that our new commercial aircraft inspectors look into the air maneuver which seems to have been invented in the middle western states. A newspaper description of the flight of a new machine states "When about seventy feet above the ground he (the pilot) shut off the motor to taxi for a short distance."



THE BELLANCA CABIN MONOPLANE
Holder of World's Endurance Record, 51 hrs. 11 min. 20 sec.
Powered with Wright Whirlwind 225 H.P. Engine

Equipped with

SCINTILLA

Aircraft Magnetos

SCINTILLA MAGNETO COMPANY, INC.

Contractors to the U. S. Army and Navy. SIDNEY, NEW YORK

The table, despite the necessarily rough method employed, shows that doping with acetyl dope actually increased the ignition point, due, no doubt, to the smaller heat capacity and there being no open structure. It is significant that the nitro-varnish P.C. 10 when applied to an acetyl-doped fabric only lowered the ignition-point by a few degrees, and that the pigmented oil varnish raised the ignition temperature, evidently through the formation of a blanket of charred matter. The nitro-doped fabrics inflame at a considerably lower temperature, and the incorporation of calcium chloride had very little influence. It has, however, an effect on the rate of propagation of flame, and so has such substances as finely ground zinc oxide, precipitated chalk, and china clay. The rate of burning of acetyl-doped fabrics is considerably lower, and if any of these substances be inserted in the dope the rate of burning is reduced still further.

Some experiments made by the author give a qualitative idea of the rate of burning of fabric strips, 12 by 1 in., having different coverings. These strips were hung vertically from a wire, kindled at the bottom, and the time recorded with a stop-watch for complete combustion. Three further experiments were performed to see if the rate of burning could be lessened by fireproofing the linen before applying the dope. Fireproofing was effected by immersing the fabric in a solution of ammonium phosphate to which an equivalent amount of aluminium-sulphate solution was afterwards added so as to precipitate gelatinous aluminium phosphate in the fibres. After removing adhering substances by washing, the fabric was dried, attached to a wooden frame, and doped.

The results are given in Table VI.

TABLE VI.

Linen	18 sec.
Linen + acetyl dope	25 sec.
Linen + acetyl dope + clear oil varnish	30 sec.
Linen + acetyl dope + k. pigment-oil varnish	31 sec.
Linen + nitro dope	12 sec.
Linen + nitro dope + clear oil varnish	16 sec.
Linen + nitro dope + k. pigment-oil varnish	14 sec.
Linen (fireproofed)	Did not burn.
Linen (fireproofed) + acetyl dope	30 sec.
Linen (fireproofed) + k. pigment-oil varnish	42 sec.

The marked superiority of acetyl dope over nitro dope is evident. The oil varnish impeded burning, but in the case of the nitro-doped fabric the dope film could be seen to be flaring underneath the varnish film. The last set of data shows that fireproofing of the fabric did diminish the rate of burning to a small extent, but when it is remembered that the fireproofing rendered the dope film less adherent, it will be gathered that no real advantage can thus be obtained.

It might be imagined that the insertion of insoluble matter in dopes may cause the dope film to become discontinuous and thereby fail to protect the fabric and to diminish the tautness. There is no doubt that hygroscopic substances like calcium chloride, as was used in a certain proprietary nitro-dope, had an undesirable effect on the tautness of the dope fabric in damp weather. Ramsbottom and Thomas (R. and M., No. 606, 1918) recommended that all coats of dope should be pigmented, for they state that pigmenting enhances the tautening power and reduces the slackening which invariably occurs in a moist atmosphere. This should also reduce the inflammability, and if khaki protect the fabric from ultra-violet radiations. They state that the greater the quantity of pigment up to 1½ lb. per gal. the more efficient will be the dope with respect to tautness. Highly pigmented dopes become brittle on weathering. This, however, can be remedied by the use of additional softening agent, and provided that a suitable cellulose acetate is used no difficulty arises over adhesion of the dope to the fabric.

In the foregoing pages little has been said in nitro-dopes. During the War they, with the exception of one proprietary dope, were restricted solely to machines for "home service," and it may be that in the future they will be discontinued altogether. The utilization of used stripped movie films for the manufacture of dope presented some difficulty, on account of the variable composition of the films and the difficulty in selecting only that material which was suitable. This, presumably, will also occur in any attempts which may be made to employ movie films for the manufacture of lacquers. The difficulties which arise are due to the fact that (a) both cellulose esters—acetate and nitrate—are now used in film making; (b) the esters used in the manufacture of films give considerably higher viscosities than are suitable for dopes; (c) variable types and quantities of plasticizers are employed, which will necessitate careful investigation before subsequent use and (d) the difficulty of stripping and drying. The high viscosity can to some extent be overcome by making the dope solutions less concentrated, but this would mean that more coats would have to be applied to the fabric with a resulting greater consumption of expensive solvents. On the whole, movie film was not satisfactory during the War, and resort was made to low-nitrated cotton. The "home services" dopes contained about 10 per cent of nitro-cellulose, 3 per cent of plasticizers such as triphenyl phosphate, and in a few instances camphor, and a small percentage of a "softener," which was usually about ¼ to ½ per cent of castor oil. The usual solvents were employed, viz., acetone, methyl ethyl ketone, amyl and butyl acetone, and as diluents, benzol, methylated spirit, and butyl alcohol.

The Caterpillar Club

The Caterpillar Club has had a more or less spontaneous growth since the forced parachute jump of Lieut Harold R. Harris in 1922. In the strict sense of the word, the Caterpillar Club is not an organization, as it has no officers, constitution or by-laws. It simply consists of a collection of data in regard to emergency parachute jumps, with a short statement regarding the circumstances and a picture of the person saved. These are mounted in the Caterpillar Club album and no other formality is indulged in, except the usual press reports.

At present there are thirty-nine members with a total of forty-five life-saving jumps. Some of the members have made more than one jump, which fact will account for the difference between the membership total and the jump total.

The jumps are distributed as follows:

Army Air Corps, 32; Marine Corps, 2; U. S. Navy, 2; Commercial, 5; Air Mail Service, 4.

The only emblem thus far suggested shows a drawing of a caterpillar, which a Dayton painter sketched on the frame of the Caterpillar Club display board in the Parachute Unit of the Material Division, McCook Field. Recently, however, the Irving Parachute Company, of Buffalo, N. Y., sent gold pins of a caterpillar design to individuals whose lives have been saved with the use of the Irving Airchute.

It is said that the Material Division is considering an insignia, showing the caterpillar poised on a mulberry leaf, to be mounted on a ring instead of a pin, owing to the fact that there is no authority for officers in the military service wearing ornaments of this nature on their uniforms.

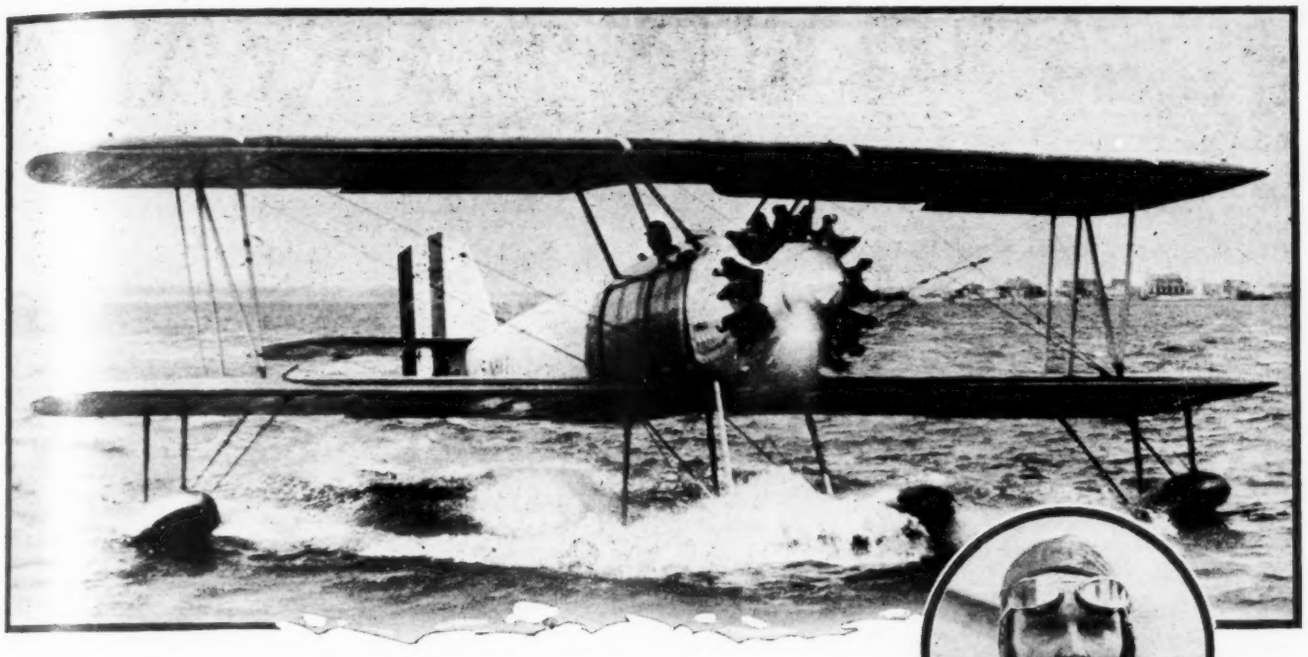
Luncheon for Pan-American Fliers

The Pan-American fliers, who arrived at Langley Field, Va., at 1:30 p.m., April 29, will be given a luncheon at 12:30 on Wednesday, May 11, by the Members' Council, of the Merchants' Association, at the Hotel Astor. Secretary of War Dwight F. Davis and other distinguished guests will attend.

The purpose of the flight was to promote amicable relations between the United States and Mexico, South and Central Americas. Major Dargue carried in the flagship "New York", which was destroyed in a collision, a considerable amount of material supplied to him with this end in view by the Merchants' Association.

Spanish Purchase Engines

A recent decree of the Spanish Ministry of War authorizes the military aviation section to secure by direct purchase 20 Rolls-Royce engines, 360 hp. each, the necessary funds having already been set aside in this year's budget.



Lieut. S. W. Calloway U.S.N., and the Navy's "Corsair" with which he made a World's Speed Record for Seaplanes.

The Vought "Corsair"

makes another

WORLD'S RECORD

A WORLD'S Speed Record for Seaplanes carrying 500 Kilograms (1102 pounds) was made by Lieut. S. W. Calloway, U.S.N., on April 23rd, in a Standard Vought "Corsair" naval observation seaplane.

The official speed record established was 147.263 miles per hour for 100 Kilometers, over the Hampton Roads, Va., Schneider Cup course.

The actual useful load carried including pilot, fuel, equipment and 1102 pounds ballast, was 1675 pounds.

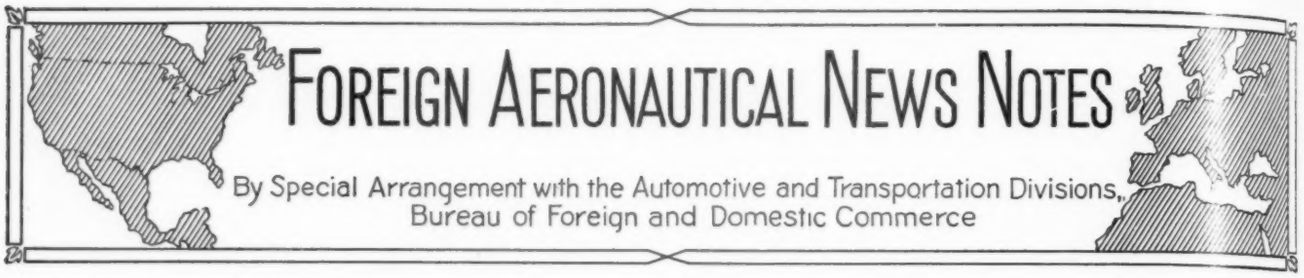
The record was made with the same standard service "*Corsair*" in which on April 14th, Lieut. Geo. R. Henderson, U.S.N., made a new World's Altitude Record for Seaplanes.

Both records were made without special preparations, the airplane, engine and propeller being the original, *strictly stock*, service equipment delivered in October 1926, and used, without changes or modifications, in all flights since.

"The stock Airplane which makes World's Records for America."

CHANCE VOUGHT CORPORATION

LONG ISLAND CITY, NEW YORK



FOREIGN AERONAUTICAL NEWS NOTES

By Special Arrangement with the Automotive and Transportation Divisions, Bureau of Foreign and Domestic Commerce

Turkish Plans for Air Revenues

A Turkish Aviation League, which is charged with the development of all aviation activities in Turkey, considered, at a general congress on Nov. 29, the following sources of revenue for the League. These proposals have been submitted to the Grand National Assembly.

1. A monoply for the importation of motion-picture films, permitting only the Turkish Aviation league, or its concessionaire, to import films into Turkey.
2. The blank forms which are exchanged in tobacco transactions between tobacco growers and merchants and the tobacco Monopoly Administration will be printed and sold by the Aviation League at a fixed price.
3. The printed forms which are used by merchants in connection with their custom-house formalities will likewise be furnished by the league.
4. Calendars and memoranda books will be printed and furnished by the league.
5. All packages of cigarettes will be supplied one cigarette short, and the equivalent of the total number of cigarettes thus retained will be paid by the Tobacco Monopoly Administration to the Aviation League.
6. Court reports will be printed and sold through the Aviation League.
7. The league will acquire the monopoly for the importation and sale of playing cards.
8. The sugar refinery at Cushak, which will open about December 27, has decided to send to each branch of the Aviation League a box of sugar. These boxes will be put up at auction for the benefit of the Aviation League.
9. A head tax of 1-3 piasters will be collected on all cattle brought across the Bulgarian border for wintering in Thrace. This tax will be collected by the Aviation League.
10. The league will acquire the concession for the establishment of a spool and thread factory.
11. The league will obtain the exclusive rights for the use of automatic vending machines for chocolate, candies, matches, etc. These distributors will be placed in public buildings and along the principal streets.
12. The coat, hides and bristles of wild boar will be marketed by the Aviation League.
13. Military discharge forms will be printed and sold the league.
14. The mercury deposits which belonged to the former Navy League will be exploited to the benefit of the league.
15. The exercise books used by students in public schools and colleges will be sold by the Aviation League.
16. Official documents emanating from Turkish embassies and consulates; passports; railway, tramcar, underground and steamship tickets; official forms exchanged between government departments; permits; bonds; and the bills of restaurants and beer-halls, shall bear an aviation stamp.
17. Old issues of postage stamps will be turned over to the Aviation League for classification and sale.
18. The league will obtain the monopolistic rights for the printing and sale of marriage forms, registers, and all sorts of judicial forms.

For the past two years the Turkish Government has shown a desire to further aviation in the country. The Aviation League was inspired by declarations of the Prime Minister, and is supposed to be a purely private organization. In fact, it is quasi-governmental.

Seaplanes for Dutch East Indies

It is reported in Java that a contract has been signed at The Hague, on the part of the Government of Netherlands Indies, with the National Vliegtuig Industrie at The Hague, for the construction of eighteen seaplanes of the Dornier-Wal type. Eleven of these planes are reported to have been definitely ordered and the other seven have been provisionally ordered subject to the appropriation by the legislature of funds for their purchase. The National Vlietuig Industrie has obtained license under the patents for the construction of the machines.

The planes are to be of the same type as those which were purchased in Italy last year and which are already in service in Netherlands Indies, with the exception that, instead of being equipped with two Rolls-Royce engines, they are to have two Lorraine-Dietrich engines.

It is also reported in the Javanese press that the Netherlands Indian Aviation Association has arranged, in cooperation with the Colonial Navy Department, for the trial flight from Surabaya, Java, to Sabang, Sumatra, and return, for the purpose of determining the practicability of a regular mail service in connection with the Dutch passenger steamers which call each week at the latter port on both the outward and the homeward voyages.

If this experimental flight demonstrates the feasibility of a regular service, it is believed in Java to be probable that the post office authorities will give serious consideration to the question of adopting this means of expediting the transportation of the mails. It is stated that from two to six days will be gained so that under the best conditions it should be possible to receive mail in sixteen days after the departure of the vessels from Marseilles and Genoa. As it is now, mail requires a minimum of twenty-two days to reach Batavia from the Mediterranean ports.

Perth-Adelaide Air Service

The establishment of an air service between Perth and Adelaide, Australia, has been proposed. Bids for the service are to be asked immediately and if satisfactory ones are received the service will be established. The Australian Post Office Department will stipulate the time to be taken in carrying the mails, and will limit the sur-charge on ordinary letters to 3d. each.

Cologne Via The Ruhr To Rotterdam

An air route from Cologne via the Ruhr to Rotterdam is proposed for this Spring and efforts are being made to have this route extended up the Rhine as far as the city of Mainz. It is believed that a seaplane service Mainz-Cologne would be attractive to tourists and it is pointed out by those in favor of the scheme that the breadth of the Rhine at Mainz would guarantee a good seaplane harbor in that city. The construction of such a harbor has been discussed for some time and it is reported that negotiations have so far proceeded that the construction could be undertaken at the joint expense of the cities of Mainz and Wiesbaden immediately upon the receipt of the sanction by the occupation authorities at Coblenz. Wiesbaden, in view of its dependency upon a good tourist attendance during the Summer, would appear to have a large interest in the project.

AIRPORTS AND AIRWAYS

Lansing, Mich.

Mr. Driggs of the Driggs Airplane Co. has been doing some worthwhile educational work in co-operation with radio station WREO of the Reo Motor Car Co. Every Thursday evening Mr. Driggs, or some other person as well qualified, has been giving talks on light planes. The basis for the talks is the Government bulletins on lightplanes which were written by Mr. Driggs.

The new Driggs light biplane has been flight tested and far exceeds the expectations of its designer. The test pilot stated that the little plane has the stability and general feel of a full sized airplane and is, in the full sense of the word, a practical airplane.

Those interested in lightplanes will undoubtedly hear something of value if they will tune in on WREO at about 7 o'clock eastern standard time on Thursday evenings.

White Plains, N. Y.

The Knoll Crest Field is no longer available for landing, as it is being laid out in streets. The new field will be ready early in May.

The Westchester Aerial Dispatch, Inc. will shortly resume operations with two planes on their popular passenger service and one plane for the instruction of students. Governor Trumbull, of Connecticut, who attended a convention at Briarcliff Lodge recently, paid Knoll Crest Field a visit. Pilots will be welcome at the new field.

Mason City, Iowa

Mason City has one of the finest airports in Iowa in prospect, according to those who have seen the level 80 acres that Hanford MacNider Post of the American Legion has leased there. By agreement with the Chamber of Commerce, the Legion will maintain the field for two years, after which the Chamber of Commerce will share the load.

The field is on the direct north and south route from the Twin-Cities to Des Moines, and it is expected to make it one of the principal airports of northern Iowa. At a conference there attended by Ralph W. Cram, N. A. A. governor for Iowa, plans were initiated for dedicating the field during the coming Summer.

Flint, Mich.

By Ralph Brockway

Wm. Clunie has returned from Santa Paula, California and officially opened the flying season by bringing his Waco over from Bud Hammond's hangar at Owosso. Mr. Carr is associated with Mr. Clunie in the flying game and the two did a very good business carrying passengers on the afternoon of Easter Sunday. The size and the "flying appetite" of the crowd indicates the best Summer yet for the "hop pilots" in this locality.

Mr. Carr has booked some students and will start instruction very soon.

LIFE INSURANCE
for Those Who Fly

Full life insurance for those who fly has been a long felt want, and we have much pleasure in announcing that we are now in a position to supply this essential coverage.

Write for particulars

Constructive total loss	Public liability
Accidental Damage	Property Damage
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Lowest Rates
Broadest Coverage Highest Indemnities

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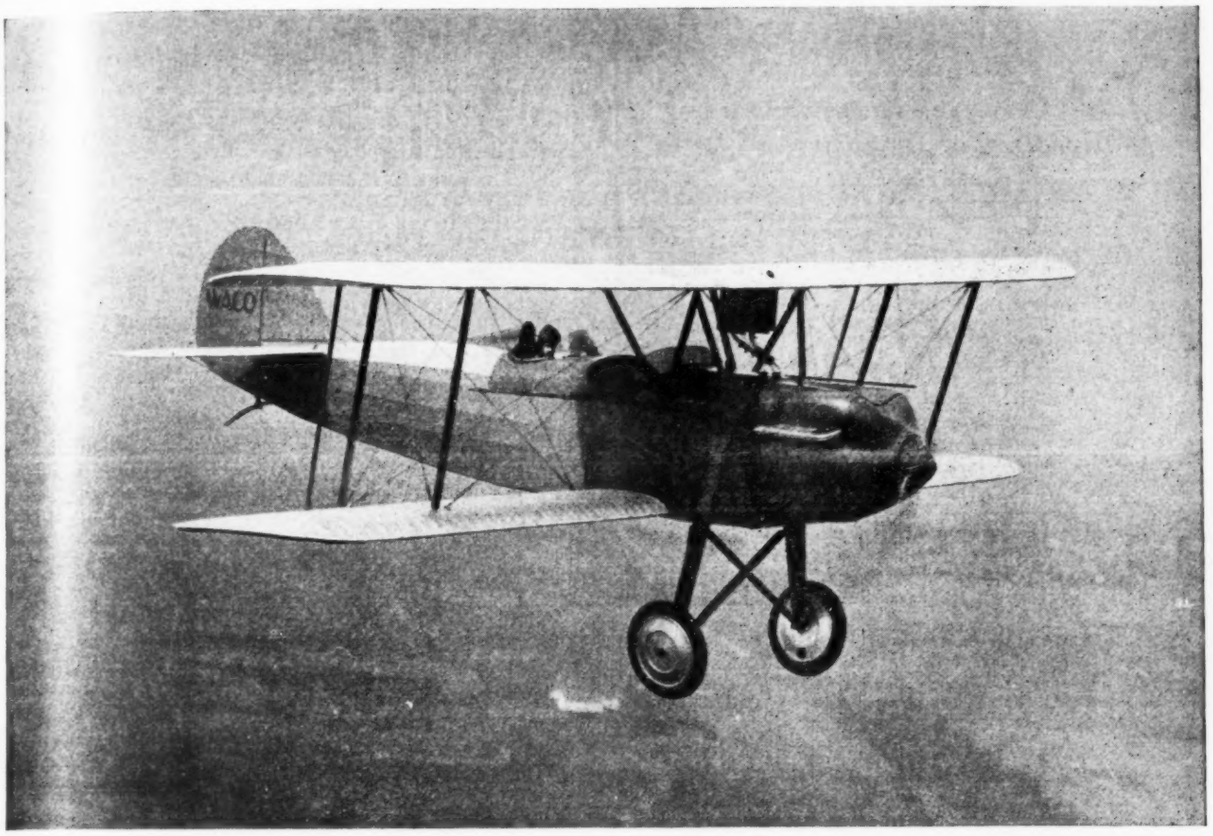
FEW engines in their development stage have had the resources and facilities of Fairchild-Caminez. A daylight factory equipped with new precision machinery, a complete metallurgical laboratory and an experienced engineering and testing staff furnish a combination from which great results may be expected. Back of Fairchild-Caminez stands the Fairchild Aviation Corporation with a successful seven years' record in the aviation industry.

Fairchild Caminez

FAIRCHILD-CAMINEZ ENGINE CORPORATION
Farmingdale, L. I.



There's unlimited *performance* behind the *beauty* of the

WACO TEN

If ever an airplane had what the present day commercial and individual owner pilot calls performance this beautiful WACO TEN certainly has it—even to a greater extent than the previous Model Nine.

Designed to perform safely with a power range of from 90 to 250 horsepower. Giving any range of speed desired.

Have one of our representatives take you for a ride—
if you are a pilot try it and learn of the wonderful
performance everybody is talking about.

A letter or wire today will bring complete information price and name of our nearest WACO Representative.

WACO
AIRPLANES
MANUFACTURED BY ADVANCE AIRCRAFT CO., TROY, OHIO

The ADVANCE AIRCRAFT Co.

TROY, OHIO U.S.A.

local radio fans from a point on the Rappahannock River. The flight was arranged as a part of the regular training at Langley Field and was operated as a non-stop flight from Aberdeen to Langley Field, via Bolling Field near Washington.

Eleventh Bombardment Squadron Transferred

Orders have been issued by the War Department for the transfer of the 11th Bombardment Squadron from Langley Field, Va., to March Field, Riverside, Cal. The Squadron will proceed by rail from Langley Field to New York, thence on the May 18 Transport to San Francisco, Cal., thence by rail to March Field, arriving about June 5. One officer and 132 enlisted men will proceed with this unit without organizational equipment. The orders provide that the number of married non-commissioned officers sent be reduced to the absolute minimum, and that single non-commissioned officers be transferred to the Squadron from other organizations at Langley Field.

Kelly Field Personnel go to March Field

With the start of Major Carlyle H. Wash, Air Corps, for his new command, March Field, Riverside, Cal., recently, the first step in the reconditioning of that field and the inauguration of the new training plan has been taken. Major Wash was followed a few days later by Lieut. A. C. Kincaid, who is to be Adjutant; Lieut. R. B. Walker, Engineer Officer, and Lieut. H. B. Chandler, of Brooks Field, who will be the Air Corps Supply Officer.

Inspection Division Created

The creation of an Inspection Division in the office of the Chief of Air Corps is announced. The new division is headed by Major F. L. Martin, whose adventures in Alaska were features of the Round-the-World Flight.

The Inspection Division is an agency directly representative of the Chief of Air Corps, operated by Air Corps personnel, and charged with overcoming problems connected with the practical operation of aircraft and air stations. It has not been charged with the inspection of material purchased from contractors, or with laboratory tests. Such work will continue to be handled by the Materiel Division.

The organization of the Inspection Division results from the fact that the airplane and its equipment have introduced many thousands of highly technical problems into warfare. In one standard type of airplane there are more than five thousand different parts. The most complex developments of chemistry, electricity and all the vast range of the mechanical arts, enter into the manufacture and repair of these parts. A list of the metals used in airplanes, engines and equipment reads like a list of all known metallic elements. A statement of the mechanical processes employed sounds like a summary of everything known about mechanics. Whole libraries have been written about metallurgy, woodworking, aircraft textile fabrics, vacuum bulbs and dozens of other divisions of knowledge, all of which are vital to the manufacture and operation of military aircraft.

The Inspection Division is charged with adaptation to Air Corps needs of such standard industrial management systems as will assist in handling this highly technical work. It inspects such systems after installation.

All the systems for the maintenance and inspection of equipment employ forms based upon a simple and effective device known as the calendar inspection record. Forms vary according to the nature of the equipment, but the principles employed are the same throughout.

In addition to outlining the work so as to remind the mechanic at the proper times, and so that the work will always be accomplished by the routine method that has been found best, the calendar inspection record provides a complete record of all inspection and maintenance operations performed by the mechanics. It also provides a record of all inspections by personnel, whose duty it is to inspect the activity.

STEARMAN
Airplanes

BY careful designing Stearman and his engineers have produced a light commercial airplane that will forecast the trend in airplane construction.

To the distinction that goes with the airplane built by Stearman are added these essential advantages:

Structure and balance which permits power plant installations from 90 H. P. to 230 H.P.

Hydraulic action landing gear on a 7½ foot tread.

28″ x 4″ tires on wheels with mechanical brakes.

Fuel tank of 50 gallon capacity with positive indicating gauges.

Complete instrument equipment and cockpit appointments.

Adjustable seat and rudder pedals for pilot.

A price which is far below that usually associated with scientific designing and engineering.

STEARMAN AIRCRAFT INC.

VENICE, CALIFORNIA

MODERNIZED STANDARD J1'S

Rebuilt from New Planes Purchased in Original Crates from U. S. Army

Fuselages are rebuilt from nose to tail; new longerons, instrument boards, new seats, new landing gears, etc.; reconstructed wings; new fabric throughout; six coats of freshly manufactured Nitrate dope, and natural color finish. Aluminum cowls are painted a light blue. We guarantee these planes to pass the Government test. Each airplane is carefully inspected and given a severe test flight before delivery.

Come to St. Louis and go through our shops and convince yourself that this is one company actually rebuilding Standards into first class modern planes.

We sold 83 of these Standards last year, and a large percentage of them were powered with the OX5 motor. All of the fuselages are reconditioned so as to accommodate two passengers in the front seat and a pilot in the rear. The Standard airplane with OX5 motor installed will carry one passenger in the front seat and a pilot in the rear. With the OXX6 100 H.P., Hispano-Suiza 150 H.P., or Curtiss K-6 150 H.P. motors two passengers in the front seat and a pilot in the rear can be carried.

Read this bargain list of Standards and other Quality Planes

New Standard J.I. airplanes, without motor; fuselage and tail members uncovered $650.00
New Standard J.I. airplane, completely covered, set up, but without motor 750.00
New Standard J.I. airplane, with Government overhauled OX5 motor installed, two place ship—(our best seller) .. 900.00
New Standard J.I. airplane, with absolutely new OX5 motor installed 1200.00
New Standard J.I. airplane, with brand new Curtiss OXX6 100 H.P. motor, three place 1300.00
New Standard J.I. airplane, with Government overhauled OXX6 100 H.P. motor, three place 1200.00
New Standard J.I. airplane, with guaranteed overhauled Hispano Suiza model A, 150 H.P motor, 3 place ship .. 1350.00
New Standard J.I. airplane, with guaranteed overhauled Model I, 150 H.P. motor installed, three place 1500.00
New Standard J.I. airplane, with guaranteed overhauled Model E, 180 H.P. Hispano Suiza motor installed, 3 place 1500.00
New Curtiss Orioles, 3 place, without motor 1750.00
New Curtiss Orioles, with Curtiss K-6 motor 150 H.P. installed, 3 place 2000.00
New Curtiss Orioles, with practically new Hispano Suiza model E, 180 H.P. motor installed, three place 2000.00
Completely reconditioned D.H. airplane, wings and tail members recovered, less motor 1000.00
With guaranteed overhauled Liberty motor 3000.00
With brand new Liberty motor 7500.00
T.M. Scout airplane, complete with new 80 H.P. LeRhone motor installed 650.00
Complete with OX5 motor 1000.00
Spad Scout plane, which we consider much better than the T.M., or T.M. Scout as it has better performance, and is constructed much better, less motor 200.00
These Spad airplanes are single seater fast Scout planes, and are in good condition but need recovering. Some of the wings need minor repairs. To close these out we are selling them at cost. The motor is for the 150 H.P. Hispano Suiza motor. It can be changed over to accommodate the OX5 motor—planes crated f.o.b. carr a. our warehouse at San Antonio, Texas less motor 200.00
Reconditioned Curtiss JN4D airplane, with guaranteed overhauled OX5 motor 750.00
without motor 500.00
with Hispano Suiza motor installed 1250.00
Reconditioned and recovered Canuck, with guaranteed overhauled OX5 motor 900.00
with brand new OX5 motor installed 1300.00
We have a special built Canuck with all lower wings finished in pigmented aluminum, blue cowls, that flew about 20 hours, which is a bargain at 1000.00
We have a few used Standard J.I. airplanes with motors at 650.00 ready to fly away in good airworthy condition.

Write for Free Catalogue of Our Flying School

Robertson Aircraft Corporation

Lambert—St. Louis Airport, Anglum, Mo.

Bertram's Airport

By Jake Bertram

The flying season opened here with a little flight on Sunday, March 26. On April 5, L. J. Bergsten, a traveling salesman for the Ward Mercantile Company, of Minot, N. D., arrived in Towner, N. D. While here he experienced trouble with his automobile. He solved his difficulties by chartering a plane and made his calls on customers at Upham, Russell, Newburg and Maxbass, the round trip of about 100 miles being made in less than five hours, including stops for business calls. Larry Harris acted as pilot.

On April 10 a plane from this airport delivered a DeLaval cream separator to its owner, fifteen miles from Towner. The plane landed in a grain field just across the road from the customer's back door.

Leach brothers have completed their hangar and have their Canuck all decked out in holiday colors. Larry Harris made the test flight on April 18. This gives the airport two planes and two good hangars. We cordially invite all tourist planes to drop in and make us a call. The field is in good shape, comprises 116 acres and is only a mile from the center of the city. The hangars will be painted white with the name Towner on top.

Both of the Leach boys expect to be soloed by Larry Harris this Summer. It is expected that an Eaglerock from Rapid City, S. D. will drop in at the airport. The agent who has this territory is expected to visit the airport and there is a possibility of an Eaglerock being added to the other plane equipment.

Myrtle Beach, S. C.

The first of the airplanes for the Myrtle Beach development arrived April 17. The plane, which is a special Swallow, was piloted by Sam J. Taylor, of Greenville.

The words "Myrtle Beach, S.C." will be painted conspicuously on the plane and the monogram of the company will be placed on both sides. The plane is the property of Mr. Taylor, with whom the company has made arrangements for use in advertising Myrtle Beach. The plane will also be used by Mr. Taylor personally to carry passengers.

UNITED STATES AIR FORCES

Martin Bombers in Formation Flight

Six Martin bombers, comprising a flight of two groups, made a successful non-stop flight from Phillips Field, Aberdeen, Md., to Langley Field, Va., recently. The two formations passed over Baltimore, Washington and Bolling Field, and came down via Tappahannock on the trip back to Langley Field. The two sections of the flight were taken from the 20th and 96th Squadrons, representing the Second Bombardment Group at Langley Field, while the personnel in charge of the six bombers were taken from all the sections of the group.

The planes left Aberdeen at six o'clock, just one hour earlier than had been scheduled, owing to a heavy northeast storm, which was brewing, and reached the hangars at the station at Langley Field at about 8:30 o'clock. All of the bombers came into the field with flying colors, and it was declared that the flight was one of the most successful ever attempted at Langley Field. It was the idea of the flight commander when he left Langley Field early in the morning for Aberdeen to leave Phillips Field about 7:00 o'clock, as the plans were to travel entirely after nightfall, but the appearance of the storm forced a change in the plans and the return home was started an hour earlier.

Major Brereton commanded the flight and was also in charge of the first section. The second flight was commanded by Capt. Rust.

The six bombers were equipped with radio and the flight was in touch with Langley Field throughout the trip. The call signal of the flight was EA-1 with 650 kilocycles and a 461 meter wave length, so the planes could be picked up by

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I have most any part of the "A" or "E" Hisso motor at corresponding prices: New Model H. Hisso Motor 300 H.P. Direct drive job complete $1000.00; Used Model H. Hisso Motor 500 H.P. Direct Drive job complete $400.00; Used Hall Scott 6 cylinder motor $125.00; Used Green Motor 100 H.P. Straight six $100.00; Used Union motor 110 H.P. Straight six $100.00; New Sturdevant 140 H.P. 8 cylinder Vee type motor $200.00; Used Curtiss 8 cyl. 200 H.P. v2c3 Vee type motor $100.00; Used four cylinder Dusenberg 100 H.P. motor $100.00.

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The work of installation is progressing rapidly. It would appear that a large section of Air Corps personnel has for sometime recognized the need for more systematic inspection and maintenance of aircraft, hence the inertia which usually greets an innovation is in this case replaced by a positive demand for the new system.

France Field Acts in Emergency

France Field, Panama Canal Zone, was recently called upon to help in a case of emergency. At 10:00 p.m. a telephone call from the interior of the Republic of Panama stated that an automobile accident had occurred in which a Bishop of the Episcopal Church, named Miller, was injured so badly that he could not be moved by any vehicle at hand, and asking for an airplane to transport him to Panama where he could reach the hospital. A Martin bomber was prepared at once for this mission and took off shortly after daybreak the following morning. Within an hour and a half the injured man was transported to Albrook Field, where an ambulance quickly transferred him to the hospital.

Squadrons Move From Luke to Wheeler Field

Because of the difficulty experienced by planes attempting to land at Luke Field, T. H., it was decided to move the 6th and 19th Pursuit Squadrons to Wheeler Field, Schofield Barracks. The move was made via truck, barge, rail and airplane.

Upon arrival at Wheeler Field the two squadrons were organized as a provisional Pursuit Group, and a little later on were designated as the 18th Pursuit Group, an entirely new outfit.

Major Henry J. F. Miller, who had preceded the squadrons, remains as the Commanding Officer. A period of organization followed the move.

Army Air Orders

First Lieut. Laclair D. Schultz, Air Corps, Washington, to Selfridge Field.

Sec. Lieut. Walter Wallace Wood, Air Corps Res., Dayton, to active duty, Washington, reverting to inactive status May 8.

First Lieut. Silas C. Hyndshaw, Air Corps, Letterman Gen. Hosp., San Francisco, to report to president of Army Ret. Board, at headquarters Ninth Corps Area, for examination, returning to place of receipt of this order upon completion of examination.

Capt. Edmund W. Hill, Air Corps, Fort Monroe, to Brooks Field.

First Lieut. Howard Z. Bogert, Air Corps, McCook Field, to duty as Air Corps representative at the Curtiss Fact., Buffalo, N. Y.

Capt. Charles B. B. Bubb, Air Corps, Langley Field, to Washington.

First Lieut. Martinus Stenseth, Air Corps, Langley Field, to Fort Riley.

First Lieut. Frank B. Tyndall, Air Corps, Curtiss Aeroplane & Motor Co., Garden City, N. Y., assigned to duty as Air Corps representative, Keystone Aircraft Corp., Bristol, Pa.

First Serg. Frank Sharpe, Air Corps, placed on retired list at Selfridge Field.

Major Walter R. Weaver, Middletown, Pa., to Maxwell Field.

Lieut. Col. James A. Mars, Air Corps, Scott Field, to San Antonio.

Sec. Lieut. Jeffrey Raymond Starks, Air Corps Res., Washington, to active duty Bolling Field, reverting to inactive status May 31.

Sec. Lieuts. William M. Creasy, Jr., Air Corps, Charles W. McGeehan, Air Corps, John P. Woodbridge, and Josiah Ross, Air Corps, relieved from further duty and training at the Air Corps. Adv. Fly. Sch., Kelly Field, and attached for duty with 2nd Div.

Major Maurice Robert Smith, Air Corps Res., Kansas City, Mo., to active duty Scott Field, reverting to inactive status June 3.

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First Lieut. Bruce C. Hill (Corps of Eng.) is relieved from detail in the Air Corps and from attachment to the Sec. Div., Fort Sam Houston, and will report to the com. gen. of that station for duty.

Capt. Otto G. Trunk, Air Corps, Bolling Field, to San Antonio, reporting to the com. off. of the San Antonio air int. dep. for duty.

First Lieut. William A. Hayward, Air Corps, Langley Field, to Kelly Field.

First Lieut. Donald D. Phillips. Air Corps, McCook Field, to Washington.

Sec. Lieut. Richard E. Cobb, Air Corps, Boston Airport, Boston, Mass., to Langley Field.

Sec. Lieut. Dwight Harvey, Inf., Fort Douglas, is detailed in the Air Corps, Brooks Field.

Sec. Lieut. Rowland Kieburtz, Air Corps, Brooks Field to Kelly Field.

Spec. Or. 291, assigning Warrant Officer Harrison Billingsly to duty with the Air Corps, Brooks Field, amended to assign him with the Air Corps, March Field.

Sec. Lieut. John P. Woodbridge, Air Corps, transferred to the Field Art. Lieutenant Woodbridge is relieved from further attachment to the Sec. Div., is assigned to the Field Art. of that division, and will report in person to the com. gen. Fort Sam Houston for assignment.

First Lieut. Courtland M. Brown, Air Corps, upon completion of present tour of foreign service, to Scott Field.

Capt. John A. Wheeler, Air Corps (Ord. Dept.) is relieved from detail in the Air Corps, Sec. Div., Fort Sam Houston, and will proceed to Fort Eustis.

Following officers, Air Corps, assigned to duty at station indicated upon completion of tour of foreign service: First Lieuts. William Turnbull, Scott Field, Guy L. McNeil, Chanute Field, Bennett E. Myers, Chanute Field, Milo N. Clark, March Field.

Upon completion of present tour of foreign service, Capt. Louis R. Knight, is assigned to Chanute Field and First Lieut. Harry H. Mills, to Middletown, Pa.

Upon completion of present tour of foreign service, the following officers, Air Corps, are assigned to stations indicated: First Lieuts. John H. Gardner, Fairfield, Walter B. Hough, Mitchel Field and Oliver K. Robbins, Crissy Field.

Following officers, Air Corps, to Langley Field from stations indicated: Majors Frank M. Andrews, Kelly Field; John F. Curry, McCook Field; George H. Brett, Fairfield; Harrison H. C. Richards, Maxwell Field; Robert L. G. Walsh, Washington; Capts. Robert Oldys, Bolling Field; Richard H. Ballard, Post Field.

Navy Air Orders

Lieut. (jg) George F. Watson det. USS Bainbridge, to Nav. Air Sta., Lakehurst.

Lieut. (jg) George W. Welker det Nav. Air Sta., Pensacola, to USS Idaho.

Lieut. George R. Fairlamb det. VT Squad. 1, Airef. Squad. Setg. Flt., to Inspr. of Nav. Airef., Buffalo.

Lieut. Comd. Bertram Groesbeck, Jr., det. Nav. Air Sta., Coco Solo, C. Z., to Rec. Bks., Hampton Roads.

Lieut. George T. Cuddihy det. Nav. Air Sta., Anacostia, to VF Squad. 5, Airef. Squad., Setg. Flt. Orders March 30, 1927, revoked.

Lieut. Wallace B. Hollingsworth det. Nav. Air Sta., Coco Solo, C. Z., to VO Squad. 1, Aircraft Squad., Battle Fleet.

Lieut. Emil J. Stelter det. Nav. Med. Sch., Washington, D.C., to Nav. Air Sta., Coco Solo, C. Z.

Lieut. George F. Chapline to duty command VF Squad. 2, Airef. Squad., Battle Fleet.

Lieut. Winfield S. Cunningham det. VO Squad. 2, USS Oklahoma, Airef. Squad., Battle Fleet, to USS Langley.

Lieut. William S. Grooch det. VO Squad. 2, USS Oklahoma, Airef. Squad., Battle Fleet, to USS Mississippi.

Lieut. (jg) Beverly E. Carter det. Nav. Air Sta., Pensacola, to USS Vega.

Lieut. (jg) Harold E. Parker det. Nav. Air Sta., Pensacola, to USS Kidder.

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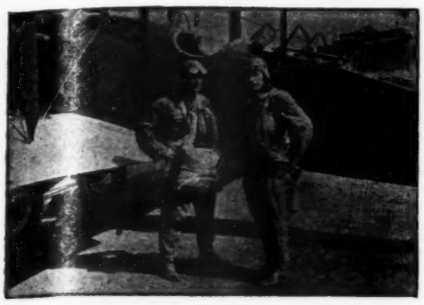

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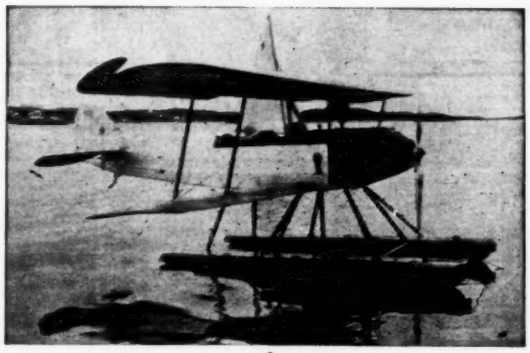

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PUBLISHER'S NEWS LETTER

Observing readers may have noticed that the name of the company publishing AVIATION has been changed and new officers are to conduct the publication in the future. So that there will be no incorrect inferences drawn from these changes, a typically frank publisher's news letter may be helpful to the readers of the paper—who after all are the makers of any publication. The writer of this page has spent over eleven years of hard pioneering in a field of publishing that has had as its principal reward the satisfaction of assisting and playing a minor role in a new art. He has seen seven competitors fall by the wayside. When times have been favorable to the aeronautical industry, the financial burden has not been heavy but when the depressions have come, it has meant the investment of no small sums to keep AVIATION from suspending and joining the other discouraged aircraft papers. When our readers realize that slightly over a million dollars have been expended by AVIATION since it started in the dissemination of aeronautical news and information, the full record of the extent of the responsibility will be realized.

* * * *

This million dollars has, of course, been largely the turnover of the receipts from subscriptions and advertising. If the publishers of the paper had wished to charge a subscription price or advertising rates that would have brought them a profit, another story might have been written, but when it is learned that the publishers have never received any interest on their investment nor have any dividends ever been declared, the full significance of the burden that has been carried may be realized. If they have contributed to the advancement of the art and science of aeronautics they have felt well repaid. With the increasing capital requirements and the growth of the volume of circulation and advertising, a continuance of the responsibility has necessarily had to be shifted to younger and more active shoulders. This has been done and the writer who has been responsible for the destinies of the paper since its inception, will take a less and less active part in the work of the company, believing that these with whom he has been associated in the publication of the paper for many years will continue to increase its usefulness as the growth of the field permits. This page will continue to be for a time, at least, the vehicle for the friendly interchange of ideas that would be out of place any where else except in a news letter. Possibly, for many years to come, it may be our privilige to contribute or subtract from the sum total of aeronautical knowledge in this way.

* * * *

The eleven years have been very pleasant. The instant welcome that *Aviation and Aeronautical Engineering*—as the paper was first called—met, was most encouraging. At the time, it was almost impossible to find current authentic and reliable technical information in printed form. It was the privilege of this paper to pioneer along these lines until other sources of information became available. Before the War, the need for a service paper for the thousands of young men who would flock to the aerial defense of democracy was realized and the Air Service Journal was started. Throughout the War it provided a weekly source of aircraft news of the activities of the great governmental aviation expansion program, industrial as well as personal. Eleven of the staff of the company publishing the two papers went into service. Those who carried on under the restrictive limitations of the censorship rendered a splendid service. After the Armistice, when the diminishing government aircraft program brought the aeronautical industry almost to the verge of ruin, serious problems faced the two aeronautical papers that had been able to carry themselves during the period of the war. One being a semi-monthly and the other a weekly it was considered advisable to amalgamate the two into a single weekly and the resulting paper has been AVIATION of the last seven years.

It would be ungracious not to give the credit for the success of the publication to those who have really made it. To those subscribers who have faithfully supported the policies of the paper should go the first appreciation. It has been their influence that the advertisers have sought. Their buying power has given this paper the first position in the field of aeronautical publications. To the advertisers who have used its pages to announce new developments and keep their products favorably known to our readers are due not only appreciation from the publishers but from the readers as well. This support has enabled the paper to exist. In a similar manner, the contributors, many of whom have written without other reward than the unselfish desire to assist in spreading sound aeronautical information are deserving of the sincerest gratitude. Fortunately, there will be no change in the staff or the general policy of the paper; it will continue to grow with the increase of aeronautical interest; it will continue to stand for those independent policies that have brought to it such a large and influential group of readers in the past. While remaining nominally the publisher for a time, the burdens will be gradually shifted to the shoulders of others and when the occasion arises we shall fold our tent and slip quietly away with the hope that the next eleven years may offer opportunities for service to the cause of aeronautics that will be as pleasant, bring as many friends and afford as great satisfaction as has the period of bringing AVIATION to manhood. L. D. G.

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New OX5 motors $295.00, Government overhauled OX5 for $195.00, used ones at $95.00. Motors can be inspected at York, Karl Ort, York, Pa.

WILL TRADE Pierce Arrow Sport Touring in first class condition for late model plane. Preferably Waco Nine but will consider another make. E. M. Burgess, Ashland, Ky.

FOR SALE: Curtiss Oriole, 180 Hisso, Motor and ship, like new, with spare wings, set of stream line wires etc. Will demonstrate. Price $1500. Box 598, AVIATION.

WANTED PILOTS Kelley Field graduates. No gamblers or drinkers wanted. Give age, business experience, etc. P. O. Box 385, Dearborn, Mich.

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